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TRAFFIC QUARTERLY

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OCTOBER 1960

Small Towns
Integrated Planning
Transport in the Arctic
Accident Prevention in Arizona
Land Economics and City Planning
Traffic Plans in Southern California
Ambulance Regulation in Buffalo
Protecting Railroad Crossings
Parking Meters in the U. S.
Neighborhoods and Traffic
Taxes and New Roads
Fleet Safety

THE ENO FOUNDATION FOR HIGHWAY TRAFFIC CONTROL

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Small Towns

The small town deserves advice and guidance to assure participation and maximum benefits from the present highway program. It should anticipate its growth, and plan for a directed or controlled expansion to assure such benefits.

The significance is often dispelled by towns' failure to put forth a reasonable, unified, and forward-looking point of view.

Many are imbued with the illusion that the perpetuation of "Main Street" is the fullest assurance of a proper future growth and a full measure of prosperity. These shortcomings arise partly from lack of foresight, from contentment and the absence of personnel familiar with essentials of planned city growth. These roads, a growing population, and improved transportation with their corollaries, if thoroughly understood, provoke provident consideration.

With only a semblance of professional guidance and the absence of capable town leadership, one may expect little more than a conflict of factional interests. This is frequently the crux of the problem that foretells their plight. In this situation, unbiased interest and foresight are paramount as the opportunity may be long in recurring.

One need not look far to see shining examples of both sides of the picture. In New England towns, the town common remains a hallmark of beauty and attraction; it has been prominent and remains prominent as the nucleus of much of their planned growth. Since colonial days, the town has afforded a place of assembly and discussion. It has served as a focal point for expanding growth.

It is difficult to assess or evaluate all the factors that contribute to a desirable form of town growth. There are many, but certainly the least is "Main Street." It is a result of unguided growth, frequently unattractive, and it leads to present-day problems that are difficult to solve.

Cities and towns each have their own points of advantage; each has its partisan, one without knowledge of proper guidance, the other in spite of it.

The days of early Whistle-Stops are a part of the past. Yet in their transition they have left their mourners. With our modern transportation and accompanying highways, town leaders should

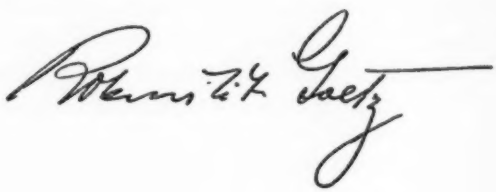
become apprehensive of the future of their small towns and cities. Some towns have kept abreast of modern times and transportation. They are shining examples of good town leadership. Others are victims of gloom and neglect.

Having now only a passive concern may well serve to aggravate the planning problems of the future.

Many small towns reveal a lack of good leadership and the absence of consideration of planned growth. Though it is a simple matter to guide or direct town growth, it receives little attention compared to other scattered highly organized promotion.

No city, large or small, can expect to put forth a reasonable, sound and persuasive plan without conviction and determination.

This requires a leader.



Integrated Planning

JOHN T. HOWARD

Professor Howard has been Professor and Head of the Department of City and Regional Planning at the Massachusetts Institute of Technology since 1957. For eight years previously, he was Associate Professor of City Planning at MIT. From 1942 to 1949 he was a partner in the Adams, Howard and Greeley firm of planning consultants. Prior to that, he had been Planning Director of the Cleveland City Planning Commission. He holds the B.F.A. degree from Yale University, and the B. Arch. in C.P. from MIT. Professor Howard has also served as special consultant to city planning agencies in Boston; Portland, Maine; Rye, N.Y.; Washington, D. C.; to redevelopment agencies in Boston, Hartford, and Providence; and to regional planning and administration groups in the San Francisco Bay Area, and in Baltimore, Los Angeles, and elsewhere. He is a member of the American Society of Planning Officials, the American Institute of Planners, and he was president of the Ohio Planning Conference in 1948.

THE most vital land areas in this country are the metropolitan areas, where most of us in increasing millions live, work, play, produce, trade, and consume.

The most vital highways, in terms of traffic volume, are the present and projected systems of express highways within metropolitan areas.

These highways, built and planned mainly by state highway departments, are subject to approval by a federal agency when major federal aid supplements the state funds.

Metropolitan areas themselves follow no such clear-cut procedure. They are built mainly by multiple private enterprise—house-builders and industrial and commercial entrepreneurs. Public facilities are built mostly with local funds, by a variety of independent local governments—cities, counties, special districts and authorities. They are planned usually by the summation of separate plans by city and county planning agencies and other bodies, with metropolitan planning groups increasingly entering the picture.

The private development, to the extent that it is guided or controlled according to plan, is governed by public decisions—often independent of each other—and by many local governmental

agencies, through zoning ordinances, subdivision regulations, utility extensions, urban renewal operations, or tax policies.

Thus the planning and development of systems of highways follow a relatively simple and orderly process, while the urban areas they serve grow and develop by a complex process under far less orderly and unified public control.

During the last few years, there has been growing recognition of the inter-relationships between these two development-processes, the one for highways, the other for metropolitan and urban growth. The two have been handled separately. The professionals in both fields—the highway engineers and the city planners—have become more and more aware of the need to integrate the process. They have been pioneering with methods to achieve their mutual objectives effectively.

This article outlines the need for new approaches in this field and the progress being made. The recapitulation of premises, generally agreed to by those who have studied the problem, leads to conclusions that are achieving more and more agreement.

PREMISES AS TO DEVELOPMENT

The interactions between circulation facilities—the highway engineer's focus—and land use—the city planner's center of interest—have long been recognized, and recently increasingly better documented. The following summary statements are submitted as accepted premises, not subject to argument.

The circulation system of an urban area, primarily of streets and highways—including also, within the larger metropolitan limits, mass transit lines—exists to serve the functional needs of the population and economic activity of that area.

The role of the system is to move people and goods: primarily (in terms of volume) within the area, among the different land uses (from residence to industry, from warehouse to central business district, and so forth); secondarily between this urban area and other places. The extent of the tasks that the circulation system should perform is determined by the pattern of land uses, expressing also patterns of resident population, employment, and commercial activity.

The origins, destinations, and numbers of movements are all

functions of this land-use pattern. This applies both to existing and to future new component parts of the circulation system, which at any given point in time is thus subservient to the land-use pattern.

Over the long run, however, the relationship reverses. Future locations of land-uses largely result from the circulation system and its impact. Changes in the pattern of accessibility of various lands bring about changes in their uses. When a large flat buildable area, formerly an hour away from an industrial labor force, is brought within twenty minutes by a new expressway, the area becomes an industrial site.

Experience in recent years indicates that such changes in accessibility induced by new highways have generally been stronger in their influence on changing land uses than have such local public controls as zoning regulations.

The corollary premise, then, is almost a truism: land-use patterns and circulation patterns are interacting, and future changes in either will affect the other.

PREMISES AS TO PLANNING

Urban development planning seeks an optimum arrangement of residential areas, business centers, industrial areas, open spaces, and such services as schools and utilities: optimum in terms of good living conditions, comfort, and convenience, and also (as necessary preconditions to good living) in terms of prosperity and economy. The central concern of such planning is the location, density, character, and extent of land uses.

In view of the effects upon land uses of the circulation facilities, it follows that city planning must involve and include the planning of the urban circulation system. Planning the land-use pattern of an urban area cannot proceed with any degree of realism or hope of success if it is independent of or in ignorance of the highway system planning for the same area.

Similarly, the planning of a highway system should involve and include plans and projections of future land-use, population distribution, and location of economic activity. Decisions on route, type, and capacity of highways, and on location of interchanges, rest upon computation of future origins, destinations, timing, length, and number of vehicular trips.

This traffic forecasting depends in turn upon assumptions as to the factors that determine traffic flow, most importantly the land-use pattern. So the planning of the highway system of an urban area cannot proceed with any degree of realism or hope of success if it is independent of, or in ignorance of, the land-use planning and projection for the same area.

The corollary premise is that neither land-use planning nor highway planning can be performed first, without distorting both the system being planned and the other system; the two planning processes, like the two development-processes, are so interacting as to be in effect reciprocal phases of a single process—*if* the resulting systems of land-uses and of highways are to fit and to function efficiently.

EXCEPTIONS

This does not mean that highway planning should be done by city planners, or that land-use planning should be done by highway engineers. And though collaboration is needed, some phases of both kinds of planning activity can do without a joint effort. Most of what a city planner (or planning agency) does is independent of highway engineering: for instance the working out of zoning standards, the review of subdivisions and the design of neighborhoods, the planning of school and playground systems, the land-use studies in connection with urban renewal, the formulation of municipal capital improvement programs.

By the same token, most of what a highway engineer (or highway department) does is independent of city planning: for instance the working out of geometrical design standards for optimum safety, capacity, and speed, the engineering and structural design of routes and interchanges, the scheduling of route construction and the supervision of construction contracts.

These lists of typically independent activity relate principally to the smaller-scale detailed design and implementation of individual elements, rather than to comprehensive planning for land-use and highway circulation for the entire urban area. Even at the small scale, cross-reference may frequently be desirable; for the impact of land-uses on highways and vice versa occurs also at this scale. An interchange may be crippled by injudicious location of a

supermarket on the feeder road; or an elementary school district may be damaged by routing an elevated expressway a block in the wrong direction. But this is not the main point.

It is at the "system" scale of planning that integration is essential. The broad patterns of land development, and the main outlines of the circulation system, are the big-scale interacting elements. Therefore if there is to be effective land-use planning for a metropolitan area as a whole, with realizable proposals for the organization of residential, industrial, and commercial development, the preservation of open space, and the achievement of other objectives of city planning, it must be directly integrated with area-wide highway planning.

And if there is to be effective highway system planning, with major routes of such numbers, directions, capacities, and interconnections as will carry the volumes and perform the functions they were designed for, it must be directly integrated with land-use planning at the level of broad decisions on area-wide land-use patterns.

PREMISES AS TO IMPLEMENTING PLANS

There is a third set of premises that deserve review, before drawing conclusions from the first two sets. All sorts of plans are to some extent influenced by the instruments that are available to carry them into effect. This feed-back occurs with both land-use and highway-system planning, which as was noted earlier are implemented through quite different kinds of processes.

The land-use aspects of urban development plans will be given effect mainly through zoning. But this tool, so effective in regulating details of land development, has been a weak reed in shaping metropolitan-wide patterns. This is mainly because only in the smallest urban areas does zoning jurisdiction coincide with the "planning" area.

In the typical metropolitan area, there are from five to fifty cities and counties, with the zoning (and the land-use planning) for each independent fragment of the region quite independently designed and legislated. Instances of joint land-use planning through metropolitan agencies are increasing; but instances of genuinely joint zoning throughout a metropolitan area do not yet exist.

For major parts of the metropolitan area, however, especially the central city, and also the extensive outlying unincorporated areas under county zoning control (such as exist, for instance, around Baltimore, but not around Boston), zoning can be counted on to control effectively any future changes in major land-use patterns.

USING 'OTHER POWERS'

Cities, counties, and other local governments have other powers that influence land-use. The powers will probably be used more directly for this purpose in the future than in the past—the strongest being the extension (or withholding) of water and sewer services, and of streets and roads other than state highways.

It would also, of course, be possible for state highway departments consciously to influence urban land-uses—that is, to implement land-use plans—through their highway operations, not merely through plans for route and interchange locations, but also through priority scheduling. This has been done occasionally on a project basis, but not (to my knowledge) systematically and in concert with a city or metropolitan land-use planning program.

In the implementing of major highway plans, cities and counties also play a role. The most direct is the building or improvement of local and feeder streets necessary to the functioning of express highways and their interchanges.

A less direct but significant contribution is through a control over land subdivision exercised to aid the highway plan, by reserving rights-of-way in developing areas in advance of acquisition, and also by controlling access to major feeders to preserve traffic capacity.

The main framework of future urban circulation systems, however, will result from express highway construction designed and built by state highway departments, and financed by state and federal funds.

It is also true that the most costly and most heavily-traveled highways for which the state highway departments will be responsible, and for which state and federal funds will be spent, will be those within present and future urban areas.

The above premises, or findings, lead to a number of conclusions

which are more and more influencing action in the highway and city-planning fields. The first pair of conclusions has to do with development, and the relationships between the systems of highways and of land-uses of the future, and the planning of these systems.

State and federal highway programs cannot succeed without effective general urban development planning. This is a sweeping claim but not beyond the logic of previous statements. First, the state and federal highway programs will stand or fall on their success within urban, especially metropolitan, areas.

Secondly, within these areas highways cannot even be designed soundly without knowledge of future land-uses, and of local feeder street and transit proposals—both within the purview of urban planning programs.

Thirdly, once designed, a long-range highway plan cannot be protected against right-of-way invasion (without extraordinary advance land acquisition) except through co-operatively administered subdivision controls, again a local planning function.

Fourthly, a highway once built cannot retain its capacity without controls over land development on its frontage and near its interchanges—controls, via zoning and subdivision regulation exercised by local government in response to local city-planning. And finally, a system of highways, once built, cannot function as designed without urban-planning controls over the pattern of land-uses, population density and distribution, employment location, and the like that will produce the general outline of future urban development assumed as a basis for the design of the system.

None of these five prerequisites for a successful highway development program can occur, except by the most improbable accident, in the absence of effective general urban development planning.

ON THE OTHER HAND

This coin has an opposite side. Local urban development planning cannot succeed without the construction, on schedule, of the main highway network essential, under our motor-vehicle technology, to provide an adequate internal and external circulation system. With our present (and forseeable) governmental and fiscal structure, the kinds of highways needed can only be financed through state and federal sources, and can only result from effective highway

planning and construction programs operated by state highway departments and supervised by the federal highway agency.

Without these highways, land-use development plans will not eventuate; such public facilities as schools, parks, or fire-protection systems will not function as planned; urban renewal projects will not be realized.

Not only the broad outlines, but also the details of urban development plans may be cancelled or subverted by a departure from the highway system plan assumed in their planning; for example an express highway, elevated instead of depressed along the edge of a commercial area, may spell the difference between prosperity and bankruptcy for a store, a shopping center, or a suburb.

For most if not all of our metropolitan areas, a successful urban development program cannot occur (except by the most improbable accident) in the absence of effective state-initiated highway planning programs.

CONCLUSIONS AS TO PLANNING

These twin conclusions on the prerequisites for sound development lead into a restatement as a conclusion of one of the premises set forth earlier. At the scale of system-planning for the entire urban or metropolitan area, and at the level of broad policy decisions on systems of circulation and of land-uses, state urban highway program planning and general urban development planning are in effect inseparable, if either is to be effective in its own sphere.

Recognition of this truth has come concurrently with the evolution of usable techniques for interrelating the two kinds of planning, techniques worked out through collaboration of the two central professions with the help of newer sciences. The emerging concepts of the dynamic interrelationships between land-uses and circulation have developed from new techniques for measuring and analyzing these relationships.

NEW FORMULAS FOR TRAFFIC FLOW

A number of metropolitan studies pioneered with these techniques, most importantly the now familiar union of a land-use survey with an origin and destination traffic survey; the offspring, a series of factors and formulas, is evidently of enormous use in

predicting traffic flow from a series of systematic land-use assumptions, and similarly predicting land-use changes from a set of highway system assumptions.

Data manipulations involve mathematical techniques well over the head of old-line highway engineers and city planners alike (including the author), though the concept central to most of them is the familiar gravity model that postulates interaction between two points as directly related to some measure of mass at those points, and inversely proportional to some function of some measure of distance. The calculations required to apply these mathematical analyses and syntheses require the use of high-speed computers, and would have been unthinkable before the development of electronic aids.

NEW TOOLS

Though the degree of precision and reliability of these techniques is yet to be conclusively demonstrated, and basic theory is still in flux, they already represent a tool for understanding and for planning that cannot be ignored by either highway planners or city planners. One aspect should be stressed: this tool is not a substitute for that basic step in any kind of planning, the making of a policy choice among realizable alternatives.

It is not push-button planning by computer. It cannot settle the goals of character and nature of an optimum urban environment that lie behind any act of city planning; nor the goals—economic, social, fiscal—as to optimum circulation system, balance between auto and transit, or role of highways in urban development, which lie behind any act of highway planning.

The new techniques do serve as tremendously valuable aids in these choices among alternatives. They also help by illuminating future consequences of one choice or another. In fact, the evaluating and testing of alternative large-scale plans has never before been possible with any such precision, economy, or speed. The final judgment may be based on "values" outside the computer's capacity, but it need no longer rest so largely on the intuition of engineers or planners.

As the technical tools have become available for effective collaboration between the highway and the city planners, the dissatis-

faction has grown with the methods typical in the past for developing both highway system plans and city plans. Too often, city plans—including express highway proposals involving state funds—have been prepared by local planning commissions and their staffs or consultants without reference to state highway programs or personnel.

Too often city plans have been prepared for single muncipalities without reference to metropolitan forces (or to metropolitan planning, so often non-existent). Both these errors reduce the utility of such city planning to highway system planning, quite aside from the raising of political problems likely to be crippling when the road plans move toward implementation. Conversely, all too often plans for state highway construction in urban areas have been prepared by state engineers or consultants on a project rather than a "system" basis, and without reference to local urban plans or personnel.

It is hopeful, however, to observe the number of effective instances of collaborative planning in recent years. Varied experience has produced a variety of methods. There follow a few examples.

A COMMON BASE

One type is the jointly sponsored survey, analysis, and projection of both land-use and traffic-flow data (e.g., the Detroit and Chicago metropolitan transportation studies). Products of such studies offer at the least a common base of data for both urban-development and highway-system planning. They do, however, stop short of truly integrated planning.

The city and metropolitan planning agencies, and the state highway departments, may proceed from this common base to independent decisions which may be inconsistent or contradictory. There is no machinery to assure a continuation of collaboration beyond the pre-planning stages. Though tremendously important as pioneers in advancing technique and theory, such jointly sponsored "studies" are a first step only.

VALUE AND RISK

A second type is the unofficial joint planning effort through collaboration among agencies at the technical level (e.g., Cleveland throughout the 1940's, where a committee of city, county, and state

engineers and planners worked together to produce a regional highway plan later formally adopted at all three levels; or, more recently, San Diego).

This kind of joint operation may add to the "common base of data" a planning process that results in compatible proposals by the responsible technicians; the risk is the subsequent need to secure concurrence by the policy-making levels, who were not included in the collaborative process.

The third type overcomes this weakness through involving the policy-makers from the beginning. This is official joint planning, involving formal establishment by city, metropolitan or county, and state highway engineering and planning agencies of a joint staff for the conduct of surveys and the preparation of systems plans for highways and for land-use (e.g., Tulsa, Oklahoma).

This kind of set-up is the most nearly ideal of any for which an actual prototype exists. Its only weakness is its temporary nature; the planning task is done well, once, then the joint agency evaporates. But the need for collaborative systematic planning is continuous—or, at least, periodic. There are, however, no present examples of permanent official joint or integrated planning agencies known to this author.

A CONCLUSION ABOUT PLANNING

This discussion of possible forms for collaborative planning leads to a final conclusion about planning: the essentials for effective collaborative effort in the planning of highways and of urban development are increasingly present, though not yet universal. An outline of these essentials follows.

The first need stems from the complex and costly methods of study and data manipulation characteristic of the new techniques. They call for funds for survey and planning work on a new scale of expenditure for such purposes.

These funds are needed in addition to normal local and state budgets for research and planning or design, and are difficult to add to these already strained budgets. As an aspect of the farsightedness of the federal highway program, however, such funds are now available from federal-aid planning moneys.

The second essential is a readiness to collaborate, on the part of

the technical and professional personnel in the highway engineering and city planning fields. This readiness, scarce not many years ago, is gradually growing through understanding and experience sparked by such milestones as the Sagamore Conference in 1958.

The third need, slower in fulfillment, is for an adequate number of competent and experienced personnel in both fields. There is still a shortage, especially in city planning; but each successful venture in collaborative planning trains a number of professionals capable of heading other ventures, and the available supply is growing.

Personnel, however, is not enough; a fourth essential is the existence of agencies in a position to collaborate. Most of those needed are in being, except for metropolitan planning agencies of sufficient stature and effectiveness to be worth working with. These are still much too rare, and generally will not come into being without action by state governments.

Corollary to the existence of effective agencies is their readiness to work together. This is less a matter of technicians and professionals than of policy-makers—elected or appointed political figures. Traditionally reluctant to surrender or share any of their powers for independent action, such men are nevertheless gradually realizing the need for collaboration (it can be put as bluntly as to say that the intelligent politicos are realizing that good results are good politics). Progress is slow in this "reform," but it is hopeful.

A summation of this series of conclusions as to planning, then, might be put thus: not only is the integration of the planning process in the field of metropolitan, system-wide planning for highways and for urban development necessary; but also it has been tried out, and it is possible. Further, the technical tools and institutional preconditions for such integrated planning are already in existence to a usable extent, and the trend is marked and hopeful.

CONCLUSIONS ABOUT IMPLEMENTING PLANS

There remain some conclusions worth comment that relate to the impact of the collaborative planning that has been discussed upon the putting into effect of the two kinds of plans, the prospects for their realization.

State highway plans and programs are generally in the best shape as to implementation. Federal aid funds and state gas tax

funds, though less than highway programmers think necessary, are far more nearly adequate to the projected need than are public funds for the carrying out of other aspects of urban development plans (to name only two examples: urban renewal, and acquisition of future-needed parks and open space).

POLITICAL-PROBLEM HURDLES

Grants of power and authority for land acquisition and construction of state highways are generally adequate, though advance right-of-way purchase needs new powers in many states. Political problems do occasionally present major hurdles. Aside from the contribution of collaborative planning to the technical soundness of highway system plans, the support of local public agencies and personnel which would grow from such collaboration would surely help to reduce political obstacles in putting through certain projects in urban areas.

The implementing of urban development plans, as was noted earlier, involves more complex processes. Cities, and to a lesser extent, counties, are equipped with land-use control powers through zoning, subdivision control, and other means. If these powers are soundly used, and co-ordinated among adjacent communities (more than has been typical), they are adequate to implement most aspects of urban development plans—but only within these limited jurisdictions.

METROPOLITAN AREAS LACK CERTAIN POWERS

Metropolitan areas as such, however, where they are not co-extensive with counties—a rare if happy accident—do not have plan-implementation powers. This, of course, is because metropolitan governments do not exist. There are only two exceptions on this continent, and only one in the United States (Miami–Dade County). Though metropolitan planning agencies exist in increasing numbers, the plans they make float without anchor to any effectuation authority—in marked contrast to the plans of municipal planning agencies.

Where highway programs are designed as systems on a metropolitan basis, as they should be, this deficiency may be serious. If urban development occurs contrary to the metropolitan land-use

plan (a drastic shift of location of industrial employment, or of density of residential subdivision, for instance), this is not only a blow to the urban development plan and its goals, but also a crippling distortion of the functioning of the planned highway system, bringing over-use and costly reconstruction to some routes, and wasteful under-use to others.

GOVERNMENT RE-ARRANGEMENT

This is not the place for a full-scale argument on the need for metropolitan government. Without agreement on a universal formula, however, every student of metropolitan problems believes that some re-arrangement of governmental powers is necessary for the healthy future of our metropolitan areas.

If it can be achieved without undue loss of local autonomy and self-reliance, some of the powers to shape the future growth and pattern of urban development should be transferred to a level of government that sees the area whole. Whether this is a new intermediate level between the state and the city or county, or whether the power is merely resumed by the state itself, this evolution of our political structure should proceed.

To bring about such a change, it is the state government which must act. Interestingly enough, this is the same level as the location of present urban express highway power, the state highway department. Inserted as a comment rather than a conclusion is the remark that, once they recognized their stake in rational and planned metropolitan development, state highway departments might well become one of the most effective sources of pressure upon state legislatures to rationalize the planning and government of metropolitan areas.

ANOTHER PROBLEM

One other implementation problem affects both highways and land-uses. In the larger metropolitan areas, rapid transit as well as expressways will be needed to meet the needs of the circulation system. In such areas, the inference from earlier pages would clearly require that the "collaborative planning" described would include transit, treating highways and transit as complementary systems rather than as competing systems.

At present, however, not only is there usually no formal machin-

ery to co-ordinate highway and transit plans, but also there are generally serious deficiencies in governmental structure that impede the construction and efficient operation of transit facilities. Again, it may not be too much to hope that state highway departments may become friendly supporters of efforts to legislate the rationalization of their one-time enemy, the transit industry.

The net of these conclusions confirms that, if there is need for collaboration in the planning of highway and urban land-use systems, the concern with this collaboration should extend into a concern with the carrying out of plans. Those centrally involved in urban development—city officials and city planners—have long been interested in and have sought to aid the implementing of state highway programs.

SOUND PREPARATION

This was enlightened self-interest, of course; but the form and size of the current federal-aid highway program owe much to the support of urban interests. Those centrally concerned with major highways—state highway departments and highway engineers—have more recently had the chance to become aware of the extent of their self-interest in the sound preparation and effectuation of urban development plans.

There is need, now, for substantial improvement of the implementation machinery, and the highway interests may be in a position to help. The changes that are needed require legislative action (political action) by state governments; the prerequisite for adequate political pressure to bring results is a significant extension of their slowly growing enlightened self-interest, on the part of both local and state political leaderships.

SUMMATION

Since we are now a predominantly urban—even metropolitan—nation, the future of our country is intimately bound up with the future of our city and suburban areas. The future livability and prosperity of these metropolitan areas will be measured largely by our success in co-ordinating the careful design and control of our urban land-uses with the careful design and construction of our metropolitan circulation systems, highways and transit.

This means, for these two interacting development-systems: co-

ordination of data-gathering and analysis; collaboration in determining goals and objectives; integration of basic, long-range, comprehensive planning, and collaboration in carrying these plans into effect.

To win this success, there is need for more rapid progress along the hopeful lines sketched out in this article. We need to exploit the growing movement toward co-ordination among the many governmental agencies, and levels of government, that are concerned with land-use and with highways. And to make this co-ordination effective, we need to encourage and extend both the higher level of technical competence and the better climate of professional understanding now developing between highway engineers and city planners.

Transportation and Economic Potential in the Arctic

K. B. WOODS AND R. F. LEGGET

Since 1954, Professor Woods has been Head of the School of Civil Engineering and Director of the Joint Highway Research Project at Purdue University. Previously, he taught at Ohio State University, and was in charge of soils work for the Ohio Department of Highways. Professor Woods has been chairman of the executive committee of the Highway Research Board since 1956, and was chairman of the committee on frost heave and action in soil from 1943 to 1952. He has received Highway Research Board awards for outstanding contributions to highway research. He was president of the American Society for Testing Materials in 1958-59, and editor-in-chief of the 1960 Highway Engineering Handbook.

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TRANSPORTATION in the Arctic! What pictures the expression conjures up. The Arctic has always had fascination. One cannot read about Arctic exploration without realizing the vital importance of transportation in this vast and forbidding area.

The Arctic now is less remote. The fact that regular airlines advertise "Arctic Routes to Europe" is one indication of the changing scene of northern development. Alaska's statehood has redirected the attention of Americans to its great potential. Correspondingly, Canadians also look northward as they see defense installations followed by exploration for Arctic oil.

This development can only continue through improved transportation. What facilities are available for moving into and about

the North? What are the possibilities for such development in the immediate future? Where are the locations in which developments are expected?

These are questions that arise as one gives thought to this last part of the North American continent to be fully explored. We shall summarize answers and attempt to give an over-all picture of the interrelation of transportation and Arctic development.

The authors have seen much of the area they describe. They have traveled in the Arctic on foot, by water, on such roads as are available, and on four of the few railway lines that touch the North. Most of their travel has necessarily been by air, and this has given them at least an over-all view of the major features of this vast area.

FOUR SEPARATE REGIONS

Accordingly, and based upon their own experience, though not perhaps in full accord with recognized physiographical division, we shall deal with the Arctic as four separate regions:

1. Alaska and the Yukon Territory, including the northern part of the interior plateau of northwest Canada and the Central Alaskan uplands and plains.

2. The Northwest Territories—Mainland, including the northern part of the Laurentian uplands of the Canadian shield and the lowlands adjacent to Hudson Bay and the Arctic Ocean.

3. The Northwest Territories—the Arctic Archipelago, a geographical division accurately described by its name.

4. The Labrador–Ungava Peninsula including the Ungava portion of the province of Quebec and all of Labrador (a part of Newfoundland), all of this area being a section of the Laurentian uplands of the Canadian shield.

FOUR-FIFTHS AS LARGE AS 'THE 48 STATES'

The area under consideration is of great extent. It includes most of the land mass of North America north of the sixtieth parallel plus some of the Ungava Peninsula south of this parallel. It has a small population, and generally the region has an adverse climate. Alaska with its 586,000 square miles of area is one-fifth the size of the forty-eight states (about 3,000,000 square miles) but has a population of about 250,000.

The Northwest Territories of Canada have an area of about 1,250,000 square miles with an estimated population of 19,000. Yukon Territory embraces 207,000 square miles and it has a population of perhaps 13,000. At the peak of the gold rush in 1901, this exceeded 27,000. The Labrador-Ungava region has an area of about 300,000 square miles with a population of not more than 10,000 people, exclusive of the new towns on the North Shore of the St. Lawrence.

The full extent of the Alaska-Canadian area under consideration is therefore about four-fifths the size of the forty-eight states, almost two-thirds the size of Canada and three-eighths the size of Canada and the forty-eight states combined.

ALASKA AND YUKON TERRITORY

The mainland of Alaska lies between the Pacific Ocean on the south and the Arctic Ocean on the north. It extends westward into the Bering Sea, at places only a relatively few miles from Asiatic Russia. The common boundary with the Yukon Territory of Canada is the only part of Alaska not adjacent to water. This extensive region contains high mountains, lowlands, plains, and plateaus—including large areas of permafrost[1] and tundra.[2]

Adjacent parts of Northwest Canada, particularly Yukon Territory, have much in common with Central and Northern Alaska from the standpoint of physiography, climate, and history. Yukon Territory has the original discovery of gold advantage; Alaska, the water transportation advantage.

In Alaska, the Copper River Valley and the Matanuska Valley are part of the Pacific Troughs between mountains of the Pacific Mountain system. Puget Sound, Willamette River Valley, and the California Valley are counterparts in the United States. Along the Canadian Coast, these troughs are submerged in the form of the Inland Passage. The Kenai and Chugach Ranges make up part of the Alaskan Coastal Range to the south of the Alaska Basins while the Alaska Range is to the north.

A LONG MOUNTAIN SYSTEM

The Alaska range with western extensions of the Aleutian range

1. Perennially frozen ground. 2. A treeless arctic plain.

and the Aleutian Islands joins the Canada Coast range at the international boundary. The Sierra Nevada-Cascade Mountains are the counterpart in the United States, thus forming a part of the highest and longest mountain system in North America.

In contrast, the Rocky Mountain system in the United States connects with the beautiful 1000-mile long Canadian Rockies at the Canada-United States border. The Canadian Rockies become the Arctic Rockies (Mackenzie, Richardson, Ogilvie, and Selwyn Mountains in Yukon Territory and the Brooks Range in Alaska) to the north, and west to the Bering Sea.

Lying between these great ranges—the Pacific Mountain system on the south and west and the Rocky Mountain system on the north and east—is a vast region of plateaus, plains and uplands—the Yukon Plateau in Yukon Territory and Alaska, and the Yukon and Kuskokwim plains and the Koyukuk and the Kuskokwim uplands in Alaska.

The climate of Northwestern North America is varied. South of the Alaska Range and west of the Canada Coast Range the summers and the winters are reasonably mild: temperatures are not greatly different from those in Southern Ontario and Michigan. Tree cover is generally luxuriant and agriculture is practical in many areas, including the Matanuska Valley.

Rainfall is high in parts of this area. In the northern part of the interior plateaus of Canada and most of the central uplands and plains of Alaska, the summers are cool with occasional high temperatures. The winters are long and severe; rainfall is between ten and fifteen inches.

As an example of extremes possible in this region, the United States Weather Bureau[3] reports an all-time high of 99°F and a low of –66°F at Fairbanks, Alaska, and for Fort Yukon near the Arctic Circle values of +100°F and –78°F.

Spruce, birch and other trees are common, although they grow slowly and are rarely of large diameter, especially in areas of permafrost. The region north of the Brooks Range is the Alaskan Piedmont and the Alaska–Yukon Coastal Plain.

The discovery of mineral resources was of utmost importance

3. *Mid Century Alaska*, United States Department of the Interior, U.S. Government Printing Office, Washington D.C., 1958, Climatic Summary, p. 8, 9.

National Film Board

Part of the Alaska Highway as seen from the air. Fifteen hundred miles long, it cost more than $100,000,000.

Quebec North Shore and Labrador Railway

A loaded ore train coming down the gorge of the Moisie River on its way to Sept-Iles from Schefferville.

R. F. Legget

Mackenzie River transport as it was until recent years. The *Northland Echo* of the Mackenzie River Transport Division of the Hudson's Bay Company with its attendant barges moored upon the Athabaska River for restocking with wood fuel cut from the bush on the river banks.

National Film Board

G. S. Diberville in Norwegian Bay, off Ellesmere Island, N. W. T.

to both Alaska and Yukon Territory, although the urgency of continental defense facilities and the need for the development of transportation systems to construct and service these units must be regarded as the most important reasons for the recent opening up of both of these great areas.

EXPLORATION, TRANSPORTATION AND ECONOMIC DEVELOPMENT

The history of Alaska[4] begins with the exploration by Alexander Chirikov and Vitus Bering of the west coast of North America into the Bering Sea in 1741. In 1790, the Spaniards explored and named the fine ice-free harbor of Valdez, now the southern terminus of the Richardson Highway to Fairbanks. Exploitation of the fur-bearing animals resulted in Spanish expeditions in 1774, and by the English (James Cook) in 1778.

Russian domination continued. The capital was changed from Kodiak to Sitka in 1806. The Yukon–Alaska border was defined in 1825 by treaty between Great Britain and Russia. The boundary was fixed in 1902 by the Alaska boundary tribunal. In March 1867, Alaska was purchased by the United States from Russia. Little of importance, however, occurred in the development of Alaska until the discovery of gold on August 17, 1896 at Bonanza Creek in Yukon Territory, then a somewhat unorganized part of the Canadian Northwest Territories. This was followed by discovery of gold at Nome in 1899 and Fairbanks in 1902.

Today the principal industry is fishing and fish processing, although mining continues important: Antimony, iron, copper, nickel and even uranium-thorium occur in southeastern Alaska. Gold is found in many districts; there are several coal fields; sand and gravel deposits are widespread, and there are several indications of petroleum.

In the Kenai peninsula, south of Anchorage, are gas and petroleum wells already in production. Drilling continues along the Kuskokwim River near Bethel as well as at Cape Yakataga and Yakutat in the Panhandle. Other known deposits include quicksilver, limestone, and even jade and asbestos. The greatest dollar volume is in gold, coal, and sand and gravel.

4. The name Alaska comes from the Aleut Alaaska, meaning the great country, *Alaska—the 49th State*, Sterling Publishing Co., Inc., New York, 1958, page 8.

Yukon Territory was made part of Northwest Territories in 1895, but in 1898, two years after the discovery of gold in 1896, it was organized under a separate Yukon Territory administration. In addition to gold, rich silver-lead deposits occur in the Keno Hill area east of Dawson. In August 1959, oil and gas were located in the Eagle Plains—and a half-million dollar drilling rig transported, piece by piece, over the Yukon's difficult surface in temperatures around −40°. With the discovery of gold, transportation in the Yukon–Alaska area became the prime problem. Ocean and river waters combined to make water transport the most important element in the transportation picture. Ocean accessibility to the ports of Alaska, especially those along the ice-free Panhandle, are still important.

So also is the great inland river, the Yukon, which penetrates Alaska and Yukon Territory as far as Whitehorse. The lower Yukon River was explored by Glazunov in 1836, and Zagoskin in 1843, and the upper Yukon by Robert Campbell in 1843. Except for nearby Miles Canyon, the Yukon permits navigation for nearly 2000 miles from the Bering Sea to deep into the interior plateaus of Canada. It is fed by a great system of lakes and rivers including the Pelly, Lewes, Teslin, Stewart rivers and the finger lakes system which includes Teslin, Atlin, Tagish, Kluane, and Laberge.

WATER TRANSPORT

In Alaska, water transportation currently includes the use of cargo vessels from Nenana on the north side of the Alaska Mountains where Alaska Railroad shipments are transferred to water for distribution to ports on both Tanana and Yukon Rivers. Operations continue from May until September. Water travel is also used on other stretches of the Yukon, and on parts of the Koyukuk, Innoko, and Kuskokwim Rivers. Also, passengers, freight, and mail are carried in coastal areas by steamship companies, especially along the Panhandle of Alaska and Southern Alaska.

The primary route to the Klondike gold field was the foot trail from Skagway, Alaska, through the White Pass of the Canada Coastal range and down the Yukon River to Whitehorse. This was a dangerous, costly, and time-consuming route. As a result, British capital was used to construct the 110-mile-long narrow-gauge rail-

road (the White Pass and Yukon Railway) from Skagway to Whitehorse in 1898, following substantially the original foot path.[5] The cost exceeded $100,000 a mile. Navigation up the Yukon River to Dawson and Whitehorse flourished for a time following the construction of the railway, but the short distance from the ice-free port of Skagway gave to the railway the economic advantage over the long waterway of the Yukon River to Whitehorse.

Even though the gold fever quickly subsided and Alaska again became an "unknown land," steps were taken by the Congress of the United States resulting in the construction of the Alaska Railroad; it was completed in July, 1923.

The new railroad, including the original seventy-one-mile-long Alaska Northern from Seward to Kern Creek, extended from Seward, through Anchorage and the coal and other mineral areas located near Talkeetna, Curry, Mt. McKinley National Park, Healy, and Nenana to Fairbanks, a distance of some 470 miles. This railroad has been in no small part responsible for recent development of fishing, mining, and agriculture and so in turn for the statehood of Alaska.

ROADS AND HIGHWAYS

Highways, too, have played an important part in the economic development of the subarctic northwestern part of North America. In 1905, the Alaska Road Commission was established, with an original purpose of providing ready transportation to Fairbanks. In 1910, an overland trail was opened from the ocean port of Valdez through Thompson Pass in the Alaska Range to Fairbanks. Noyes states:[6]

"The time of travel from the United States was cut from several months in the case of average river travel through Saint Michael (in the delta of the Yukon River), to fifteen or sixteen days, winter or summer."

Without question the most important new road in the Yukon-Alaska area is the Alaska Highway, constructed in 1942. The road extends from the "end of Rail" at Dawson Creek, B.C., to Fort St.

5. "The White Pass Route" by W. D. MacBrien, *The Beaver* (Winnipeg), September 1954, p. 18–23.

6. John R. Noyes, "Transportation in Alaska," The Military Engineer, March–April 1953, p. 99–103.

John (first established in 1805), Fort Nelson (1800), Testlin, Whitehorse, Northway and Fairbanks, in all a distance of 1,527 miles. Additional roads connect with Haines (Haines Cutoff), Valdez (Richardson Highway), Anchorage and Fort Yukon (established in 1847) and Circle (by way of the Steese Highway). The highway has been of great economic importance to Alaska and adjacent portions of the Canadian northwest in connection with mining and agriculture.

The road is used extensively by Canadian and United States tourists and for the transportation of many kinds of food and other products from Southern Canada and many parts of the United States to Alaska and Yukon Territory. Currently, a road is being extended from Fairbanks to Chena Hot Springs.

Since Alaska became a state, road building has sharply increased. During the next fifteen years Alaska may have as much as a billion dollars to spend on its road system with more than $40,000,000 being spent in the 1960 fiscal year.

Included in a proposed new system will be an extension of the Fairbanks-Livengood road to Nome, and a proposed extension of the Talkeetna road westward to McGrath and north to Ruby and to McGrath south to Dillingham and Bristol Bay. Additional proposals include several connections from the Panhandle into Yukon Territory and British Columbia. With the expansion of the road system in Alaska, additional homesteading and an expansion of agricultural pursuits may be expected. The Fairbanks community now has a population of about 33,000 and the Anchorage area has grown to something over 100,000 people.

AIR TRAVEL FACILITIES

Air travel is today the life line of this great land mass of North America, especially when considered in the light of available land transportation facilities. It has been stated that air miles per capita traveled in Alaska are higher than anywhere in the world. The primary airports of this vast region are at Whitehorse, Yukon Territory and at Anchorage and Fairbanks, Alaska.

There are also many additional military installations such as those at Big Delta, Nome, Point Barrow. Dozens of airfields and even gravel strips augment such major facilities as those at Seward,

Valdez, Platinum, Fort Yukon, Stevens, Ruby, Galena, Circle, Circle Hot Springs, Tanana, and Northway.

In 1920, the U.S. Army pioneered in sending four military planes on a round trip between New York and Nome and in 1924, Lt. Carl Ben Eielson made the first air mail flight to Alaska. Today commercial airlines make regular connections between Whitehorse, Fairbanks and Anchorage with cities in Canada and the States. Airlines with regular services include Pacific Western, Pan American, Northwest Airlines, Pacific Northern Airline and several intra-Alaska airlines.

In 1942, Canada and the United States jointly developed the Northwest Staging Route that included the construction of several fine airfields situated close to the Alaska Highway. These fields plus the large base at Whitehorse greatly improve flying safety in this area.

THE NORTHWEST TERRITORIES (MAINLAND)

A second region of great size and economic potential is the mainland part of the Northwest Territories.[7] The area under consideration extends from the Canadian and Arctic Rocky Mountains on the west to the Hudson Bay on the east. The western portion of the Territories consists of the muskeg-covered Mackenzie Lowlands. To the south the Lowlands give way to the higher Peace River Plains and the Saskatchewan Plateau of the Great Plains. Great Bear and Great Slave Lakes are located on the boundary between the Lowlands and the Laurentian Upland of the Canadian Shield.

By far the major portion of the Laurentian Upland north of the 60th parallel is made up of the Barren Lands, mostly an uninhabited bare-rock and lakes area. The tree line extends roughly from the southern shores of Great Bear lake to south of Churchill on Hudson Bay. The permafrost boundary is about one hundred miles south of this boundary, but this gap increases to almost four hundred miles in western Canada.

The political boundary of the territories coincides with the northern boundary of the provinces of Manitoba, Saskatchewan,

7. "The Northwest Territories Geographical Aspects" by N. L. Nicholson. Canadian Geographic Journal, Vol. 60, January 1960, p. 2–27.

Alberta, and part of British Columbia. To the east is Hudson Bay, Hudson and Davis Strait and Baffin Bay. In the northwest the boundary is common with the eastern edge of Yukon Territory.

Administrative divisions are the Districts of Mackenzie on the west, and Keewatin along Hudson Bay on the east; the District of Franklin includes all of the Arctic Archipelago to the north. All of the islands in Hudson Bay and James Bay are part of the District of Keewatin. Fort Smith on the Slave River immediately north of the Alberta-Northwest Territories boundary is the administrative capital. It has a population of about 300.

The western part of this great area has been served, from the time of its first exploration, mainly by water transportation on the Mackenzie River System. The eastern section has been served by means of marine transportation coming into Hudson Bay, through Hudson Strait from the Atlantic.

Between these two relatively accessible regions lie the barren lands which have as yet been seen in detail by relatively few people. For the past 175 years the area has existed generally on an economy of hunting, fishing and trapping, but the discovery of valuable ores in the years immediately preceding World War II started a change in this immense territory. Prior to the discovery of gold and later uranium, oil had been found at a location now known as Norman Wells, on the Mackenzie River.

THE MACKENZIE RIVER SYSTEM

The Pioneer Discovery Well was drilled here by Imperial Oil Limited in 1922 but the remote location of this discovery limited the development that might otherwise have been expected. At the site of this well, further drilling to serve the Canol Project was carried out during the war, yet even this development did not lead to any large permanent oil field in any area, even though the Norman Wells plant does now produce sufficient oil for all needs on the lower Mackenzie system. It is to this great river, the seventh largest river of the world, that attention may first be directed.[8]

Alexander Mackenzie made his epic journey of discovery in 1789 down the great river that now bears his name, traveling from

8. See "The Canadian Northwest: Its Potentialities," Ed. F. H. Underhill, University of Toronto Press, 1959 (esp. "An Engineering Assessment" by R. F. Legget. p. 6–22).

Chipewayan to the Arctic Coast and back, about 3,000 miles, in 100 days. For 150 years thereafter the Mackenzie River system remained the main transportation route for almost all of the Northwest, and for the western Arctic. A few ships have sailed into the Arctic from the Pacific through Bering Strait; a few travelers with dog teams and sleds have made winter journeys to and from the south.

In the main, however, it was inland water transport that alone served this vast area until the recent war years. The first steamboat was launched in 1883; the first diesel tugboat appeared in 1938. The first airplane flew into the Mackenzie valley in 1921 but, even in 1939, the regular air service by then established used only small ski- and float-equipped planes, since there were no permanent landing strips in the entire valley, regular air routes still following the great river.

The Mackenzie River system starts as the Athabasca River, rising on the eastern slopes of the Rockies west of Edmonton, and flowing into Lake Athabasca which, in turn, drains into Great Slave Lake down the Slave River, to be joined by the Peace River from the west. The Mackenzie River proper flows from Great Slave Lake to the Arctic Ocean, its principal tributaries being the Liard, the Bear, and the Peel, all of which have served as regular transportation routes.

From a point about 300 miles north of Edmonton (Waterways), where the Clearwater River joins the Athabasca, the combined river system provides a navigable waterway to the Arctic coast, 1,600 miles in length, with but one impassable section, the twelve miles of rapids on the Slave River between Fort Fitzgerald and Fort Smith (at the 60th parallel), to circumvent which a portage road has long been in operation. This formidable distance is the great barrier to northern transportation: it is just about the same distance as from Winnipeg to Montreal.

From Edmonton to the Arctic Coast freight therefore moves by four stages—by rail to Waterways, by the upper river fleet to Fort Fitzgerald, by truck or tractor across the portage road, and by the lower river fleet from Fort Smith to Tuktoyaktuk. The river traffic is handled on barges which are pushed now by diesel "tugs" but previously by the old wood-burning stern-wheeler steamboats of

the Mackenzie River Transport service of the Hudson's Bay Company which terminated its operations only recently.

The river fleets have to be shallow-draft, the Athabasca sometimes having as little as three feet of water over its sand bars. Navigation of shallow-draft vessels across the open waters of the two great lakes is quite hazardous. The upper river has an open season of about four to five months, the lower river less than four months. In this short period, the freight for an entire year has to be moved; hence storage and trans-shipment arrangements at Waterways are vitally important.[9]

This was the transportation picture for the Northwest until 1942 when permanent airfields were established at six strategic points in the great valley, the most northerly then being at Norman Wells. A road has been built from Grimshaw to Hay River and is now being extended to Yellowknife; this assists in moving freight on the lower river somewhat earlier than previously but the short open season of navigation (complicated by the fact that the Mackenzie system thaws first in its headwaters, thus causing serious flooding in its lower reaches at every break-up) still limits the effective use of the river.

Today, therefore, the lower Mackenzie valley—the Northwest with the exception of the Yukon and northern British Columbia—is served by a regular air service from Edmonton and by the summer freighting service on the river. Feeding the latter is the upper river service from Waterways, freight trucked to Hay River by road, and small shipments made early each season from Fort Nelson (reached via the Alaska Highway) down the Liard River to the Mackenzie, while the former is at flood level. A railway is being planned to Pine Point (on the south shore of the Great Slave Lake) and this will give access to the Great Slave Lake similar to that provided by the Grimshaw–Hay River road.

There will still remain, however, the thousand miles of river between Great Slave Lake and the Arctic coast served only by water and air. Some special supplies have been brought into the valley in the winter by over-snow tractor trains, such as some of the supplies for DEW line construction hauled in from Alaska across the Yukon, but high costs will prevent this from being anything but

9. "Machines for the Mines" by R. F. Legget, *The Beaver*, March 1941, p. 20–22.

a special service for some time yet to come until regular instead of special winter roads can be used.

The Canadian government has developed an extensive program for road construction in northern Canada, just as the U.S. government did for Alaska. Part of this plan consists in supporting provincial governments with funds for the building of Roads to Resources, upon which $145,000,000 is scheduled to be spent in the construction of 4,000 miles of roads.

These will extend existing roads running northward. In the western provinces, they will lead in to the Northwest territories. Extensions are also planned to branches of the Alaska Highway, to give access to northern parts of the Mackenzie valley. But it must be noted that these can only connect with the two existing roads from the outside and so are limited in extent; that construction and maintenance may be relatively very costly; and that unless they are built to unusually high standards they will not be suitable for carrying the very heavy loads now handled with such relative ease on the river.

It is useful to recall that it is cheaper to construct and maintain a good railway line than a first-class paved highway, and to observe that Knob Lake, Moosonee, and Churchill (for example) are all served by railways only, despite their importance. The importance of roads is not to be minimized; but if their construction is not to be subsidized on a scale never yet envisaged, it is clear that the Mackenzie River system is going to continue to serve the Northwest for a long time to come.

This means that freight shipments into the area have to be planned long in advance (usually a year) in view of the short and crowded summer shipping season, and that the high costs involved must be realistically appreciated.

THE HUDSON BAY RAILWAY

Another example of the way railways from the south are sometimes constructed to exploit the use of water transportation is to be found on the west shore of Hudson Bay. This inland sea is almost one-half million square miles in size, being about 850 miles long and 650 miles wide. The Bay has great navigation potential except that southerly winds from the Arctic Ocean hold the pack ice in at

the mouth until July. Thus its use by ocean freighters is usually confined to a period of something less than ninety days each year.

Despite this serious handicap, Churchill (first established as a trading post as Fort Prince of Wales in 1688, becoming a heavily fortified stronghold for Northern Canada) is now a major Canadian grain-shipping port, receiving grain from Winnipeg by way of the Hudson Bay Railroad.

Construction of this railway was begun in 1911, and was completed (by way of The Pas) in 1929, with the original terminal of Fort Nelson at the mouth of the Nelson River to the south of Churchill having been abandoned in 1927 in favour of Churchill. Despite heavy maintenance resulting from deep frost penetration, deep winter snow, permafrost, and problems of muskeg, this line continues as a successful operation.[10]

Although constructed, in part, for different reasons, the Ontario Northland Railway has an extension of its main line from North Bay, extending from Cochrane (where it crosses the C.N.R.) to Moosonee on the southwest shore of James Bay. Construction of this line was completed in 1932.

Commercial air service out of Edmonton is now available throughout the year to Fort Smith, Hay River, Yellowknife (founded in 1935 following discovery in 1934 of rich gold and silver deposits, and the largest town in Northwest Territories with a population of about 4,000), as well as to most of the villages along the Mackenzie River such as Fort Providence, Fort Simpson, Wrigley, and Norman Wells.

Towns such as Port Radium on Great Bear lake (established in 1933, following discovery of pitchblende in 1929), and Aklavik (an important fur area first established in 1912, and now being replaced because of severe problems of permafrost and foundations by the entirely new town of Inuvik) on the delta of the Mackenzie River, are served by float planes in summer and ski planes in the winter.

During the spring thaw and the fall freeze, such towns are actually isolated for a period of four to six weeks during each of these periods. One of the main reasons for the establishment of Inuvik was to provide an all-weather airport on the Arctic coast;

10. J. L. Charles, "The Hudson Bay Railway." Paper recently published in Proceedings A.S.C.E. Details will be added later.

this is now in use, the regular commercial service from Edmonton now terminating here.[11]

THE NORTHWEST TERRITORIES: ARCTIC ARCHIPELAGO

The Arctic Archipelago has been an attraction for explorers for almost 400 years chiefly because of the continuing interest in seeking for the Northwest Passage between Europe and Asia. Frobisher reached the southern tip of Baffin Island in 1576; Henry Hudson discovered Hudson Bay in 1610; Baffin reached Baffin Bay in 1616; Sir William Parry first saw Melville Island in 1819; and Sir John Franklin's ill-fated final expedition was lost on King William Island in 1848. These are but a few of the highlights in one of the most dramatic chapters in the history of man's exploration of the earth on which he lives.

The long search for the Northwest Passage reached its first culmination between 1903–06 when Ronald Amundsen first made a successful passage through Lancaster Sound in his famous ship, the *Gjoa*. The passage was not sailed again until 1940–42 when Captain Larsen (now Superintendent Larsen of the R.C.M.P.) successfully sailed the R.C.M.P. schooner, *St. Roch*, through from west to east. In 1944, he made the return journey, successfully completing this in one season.

Not until 1954 was the Northwest Passage penetrated again, on this occasion for the first time by a deep draft vessel, the H.M.C.S. *Labrador*, of the Royal Canadian Navy. In 1937, the S.S. *Nascopie* of the Hudson's Bay Company, sailing westward from the Atlantic, successfully trans-shipped some of its cargo to a small vessel of the same company, the *Aklavik*, which had sailed in from the western Arctic.

This cargo transfer was repeated once or twice, but the practice was abandoned in 1940 as uneconomical. The Northwest Passage therefore remains a formidable barrier to ocean navigation through the Arctic Archipelago. In this respect, as in others, it contrasts markedly with the relatively easy route along the north coast of Siberia.

This reference to the Northwest Passage is an appropriate in-

11. "The New Aklavik: Search for the Site" by C. L. Merrill, J. A. Pihlainen and R. F. Legget. The Engineering Journal, Vol. 43, p. 52–57, Jan. 1960.

troduction to a brief survey of transportation to the Arctic Archipelago since the provision of supplies for the small scattered posts in the islands remains one of the world's most difficult transportation operations.

There are twenty-seven major islands making up the Archipelago with innumerable smaller islands.

Baffin Island is the largest; its area is 183,810 square miles, the largest island in Canada. Great Britain transferred the islands to Canada in 1881. In 1956, the islands of the northern Arctic were officially named the Queen Elizabeth Islands in honor of the reigning monarch of Canada. Far above the tree line, beset by some of the worst weather in the northern hemisphere and, in most respects inaccessible except on foot until the advent of the airplane, the islands remain a forbidding part of North America, except for the few summer weeks when the general impression of the entire lack of vegetation is briefly challenged in some locations by a profusion of Arctic wild flowers.

Generally the surface of the ground is bare rock or muskeg-covered perennially frozen soil. The Geological Survey of Canada is now actively exploring the islands, being greatly aided in this work by the use of helicopters and very small wheeled aircraft.

Already it has been found that an appreciable part of the northwestern islands has not been glaciated even though some of Canada's major remaining glaciers are to be found in the high lands of the eastern islands and in particular on Baffin Island. The east coast of this rugged island rises to heights of over 10,000 feet. It presents some of the most spectacular scenery anywhere in North America.

Apart from visits by explorers, the islands remained generally the domain of the Eskimo and of isolated trappers until the outbreak of the Second World War. Five Joint Arctic Weather Stations were eventually established by the Canadian and U. S. Governments in what was, in every sense, a pioneer operation.

Building supplies, instruments and personnel were all taken in by a series of air lifts and stations were established (in 1947) at Resolute Bay on Cornwallis Island, at Isachsen, Mould Bay, Eureka and Alert on the northern tip of Ellesmere Island only 600 miles from the Pole.

The annual supply of these stations has necessitated air opera-

tions of considerable extent and daring. The construction of other defense installations, notably the DEW line, also called for major aircraft operations and for the corresponding construction of a number of useful landing strips.

Bulk supplies, however, have had to be brought in by sea. In this operation, the long-standing tradition of the Hudson's Bay Company, in supplying its own small scattered trading posts by means of its famous ship the *Nascopie*, has been followed to a steadily increasing degree. The Canadian Government has steadily increased the number of its own ice breakers and service vessels, having now taken over from the Hudson's Bay Company the annual inspection voyage to all the major civilian stations in the eastern Arctic.

For the construction of the DEW line stations a major marine expedition on what can only be called a "crash" basis was organized largely by the U.S. Navy but with Canadian assistance and quite remarkable quantities of freight were safely delivered to points along the northern Arctic coast of Canada. The supplying of these defense stations and the civilian stations has now been put on a regular basis and the eastern Arctic supply operation is now a major enterprise of the Canadian Department of Transport.

To illustrate the extent of this operation and its complexity, the sole means of access for this area for anything but passengers and light freight: In 1959, forty-seven governmental and civilian agencies were involved in the sending of supplies to the fifty ports of call at which freight was landed. A fleet of thirty-one chartered vessels was used, supplemented by ten vessels from the Department of Transport. Lighters totaling 125 were used to unload freight from this large flotilla on the shallow beaches at each of the tiny stations. The average cost worked out to be from $85 to $160 a ton from Montreal to different areas of the Arctic.

The corresponding figure for freight delivered to points in the western Arctic was only 24,000 tons. Most of this freight was delivered by way of the Mackenzie system to the trans-shipment port of Tuktoyaktuk on the Arctic coast, just to the east of the great Mackenzie delta. Relatively small vessels are used for this western operation but the difficulties correspond with those that are now so well known in the eastern Arctic.

Extending northward from the Gulf of Saint Lawrence to Hudson Strait and Ungava Bay and from Hudson Bay eastward to the Atlantic Ocean, is a large plateau region generally known as the Labrador-Ungava Peninsula.[12] The plateau is some 2,000-feet high and slopes gently from the interior westward to Hudson Bay and James Bay. On the east the Peninsula is higher, with some peaks of the Torngat Mountains being between 5,000 and 6,000 feet.

THE LABRADOR-UNGAVA PENINSULA

The coast line is dissected and jagged, with Lake Melville occupying a fiord-like position at the mouth of the 600-mile long Hamilton River. Pryer[13] has suggested that the high eastern portion be designated the Labrador Highland, the dissected southern edge the Laurentian Front, and the entire interior the Labrador-Ungava Plateau. Not a single river flowing from the plateau is navigable for any appreciable distance from its mouth, including the Hamilton which drops 1,038 feet over a distance of sixteen miles and 245 feet at Grand Falls alone.

The winters are long and cold. Summers are short with occasional periods of high temperatures. Total precipitation is high with fresh snowfall above 100 inches a year. The central portion of the Labrador-Ungava Plateau contains great bodies of water. Hydroelectric power is being developed extensively and there is great additional potential.

Muskeg, two or more feet thick, forms much of the terrain and the forest cover includes spruce, balsam, fir, tamarack, willow, alder, and some birch. The central and northern portion of the Labrador Peninsula is rich in mineral wealth, especially iron ore. The entire northern part of the Ungava-Labrador area is underlain by perennially frozen ground.

The divide separating the waters flowing to the Atlantic Ocean from those to Hudson Bay and the St. Lawrence River is also the boundary separating Labrador—part of the Province of Newfoundland—from Ungava or New Quebec, which was added to the

12. As a general reference see: Hare, F. K., "The Labrador Frontier," American Geographical Society, New York, 1952.

13. Pryer, F W. J., "Banded Sediments in the St. Lawrence-North Shore Section of Quebec," a thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in Engineering, Purdue University, Lafayette, Indiana, January, 1958.

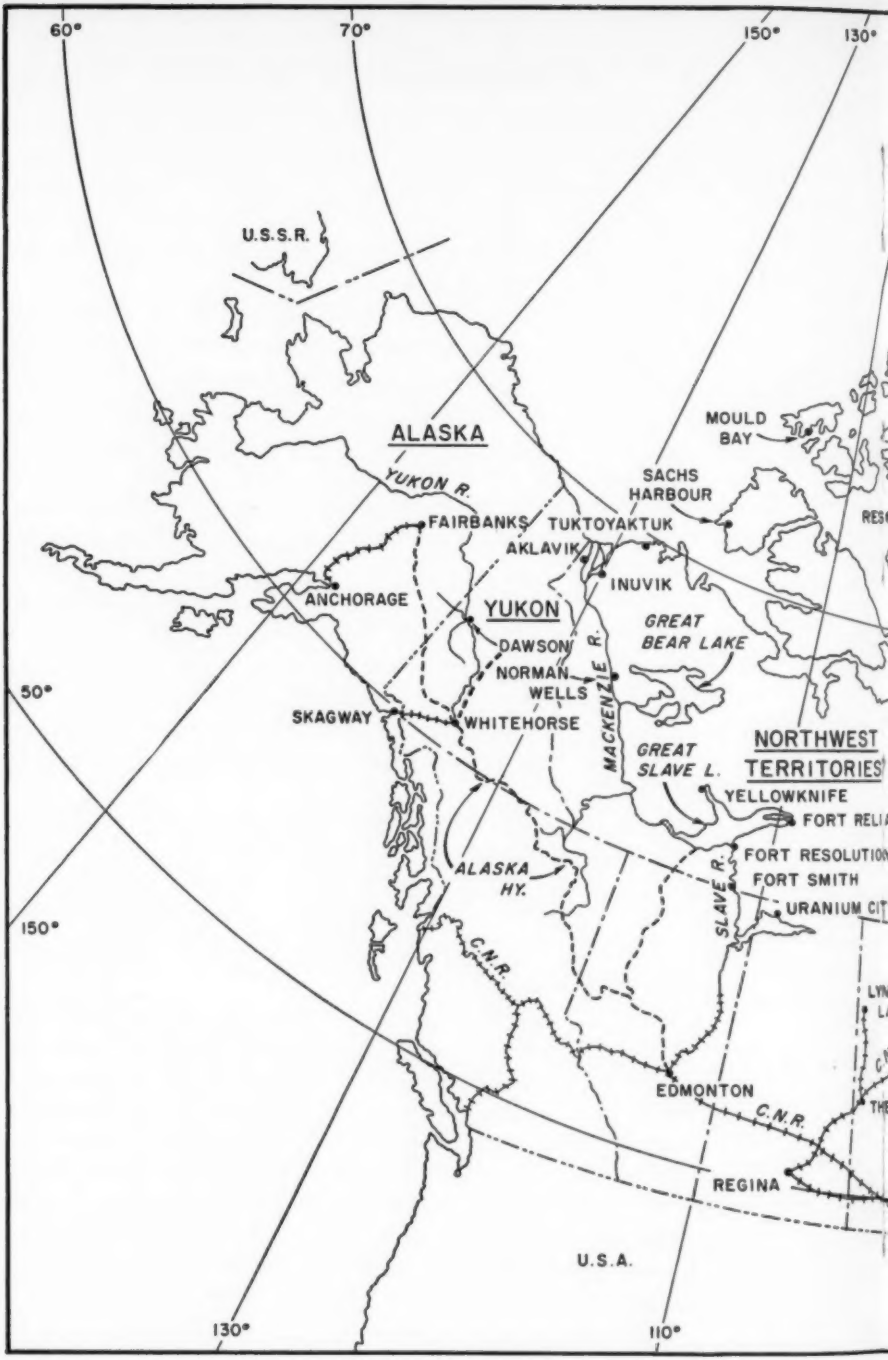
Province of Quebec in 1912. Labrador (110,000 square miles) with a population of about 5,500 (1,300 Eskimos) comprises less than a third of the Labrador Peninsula, with Ungava (240,000 square miles) having until relatively recent years a population of no more than 3,000. New developments in the extensive mining of iron ore are altering these population figures markedly.

Until recently, the entire Ungava-Labrador region was sparsely settled with a few very small villages along the Atlantic Coast and the Quebec North Shore. Along the Atlantic Coast of Labrador are: Battle Harbour, the county seat, Cartwright, Rigolet, Hopedale, and Nain, none of which has a population of more than 100 people. Lumbering and fishing are the chief occupations. Transportation is entirely by water, although the large Goose Bay air base on Lake Melville near the mouth of the Hamilton River is reasonably accessible to people of Rigolet.

In the north of Ungava is Fort Chimo at the mouth of the Koksoak River which flows into Ungava Bay. Crystal I air base is six miles to the south. Except for a few small settlements and posts along Hudson Bay, this fort constituted the primary establishments in the whole of the Ungava area north of the Laurentian escarpment, until the recent construction of the modern iron-ore town of Schefferville.

Lying between the Laurentian front south of the Ungava-Labrador Plateau and the St. Lawrence River is a narrow strip of land known as the Quebec North Shore. Although considerably south of 60th parallel—the primary area under discussion—this small region is developing rapidly as the gateway to the interior of the Labrador Peninsula.

Lumbering, pulp and paper manufacture, some mining, fishing, and fur trading, excellent water transportation along the coast, and more recently the development of iron mines in the interior have combined to create larger settlements than any in the interior of the Labrador Peninsula or along the Atlantic coast. Clarke City, for example, the pioneer pulp and paper town of the North Shore, located on the Marguerite River, has a population of about 1,000. A few miles downstream on the St. Lawrence, close to the mouth of the Moisie is the old Indian village of Moisie with a population of several hundred.



Transportation Facilities of Canada.

National Research Council, Division of Building Research

Lying between those two communities is the thriving new town of Sept Iles with a population in 1950 of 600 but a current population of about 15,000. Jacques Cartier landed there in 1534, and the general area may have been visited even earlier by John Cabot in 1498, Corte Real in 1500, and Sebastian Cabot in the early fifteen hundreds, if only because of the fine natural harbor.

The town is located adjacent to this beautiful, well-protected harbor and has an excellent airfield, originally constructed during World War II as an auxiliary field to the military establishment at Goose Bay. There is therefore good reason for Seven Islands having been chosen as the location for the southern terminus of the recently constructed Quebec, North Shore and Labrador Railway which now carries millions of tons of iron ore a year from the mines at Schefferville, 356 miles north at the edge of permafrost in the heart of the iron-bearing Labrador Trough of the Ungava-Labrador Plateau.

Additional railroad construction is now underway to the north of Clarke City. The new Sept Iles with expanding population and with many beautiful modern homes, shopping centres, and hotels is an example of sudden and exciting growth of an area resulting from the development of great mineral wealth.

The future appears bright for Seven Islands, Clarke City and similar towns along the north shore. Good roads connect Moisie, Seven Islands, Clarke City and other communities to the south and west. In the not distant future, a good road will provide easy motor connection between Quebec City, the Saguenay, Baie Comeau, Clarke City and Seven Islands. Air and railroad service will then be available to the vacationer for camping, hunting and fishing the great natural system of lakes and rivers throughout much of the Ungava-Labrador Plateau many miles to the north.

The construction of the 356-mile-long QNSLR is, of course, the basic transportation development that has made possible the opening of mines at Schefferville for bringing ore to the dock facilities at Seven Islands. Since much of the ore is transported to the steel mills of Southern Ontario and to the Ohio-West Virginia area, it is not surprising that the start of construction of the newly developed St. Lawrence Seaway was influenced by this major iron-ore development.

The great engineering accomplishments in the construction of the Seaway are well known to the people of Canada and of the United States. The reverse is probably true with respect to the construction of the QNSLR, especially in the case of the United States public.

Here is a modern engineering project constructed in the face of the most trying obstacles of adverse climate, adverse terrain, and in a relatively uninhabited, little known-region. Transportation and communication facilities were originally strictly primitive. In addition, all supplies, materials of construction, labor and power had to be imported.

Here is a story of the combined use of land locomotion, interior waterways, and (above everything) the use of air for transporting men, supplies, and equipment for the construction of the railroad. Illustrative of importance of air transportation, more air freight was flown in for the completion of this railroad project than was required in the post-World War II Berlin airlift.

With construction completed, many new engineering problems arose, such as the provision of water supply, fire protection, sanitation, heating and lighting, communications, and transportation for the new towns, as well as problems of railway maintenance. The railway itself is located in a greatly varied terrain containing deep deposits of soft, banded sediments at the southern end of the railway[14] [15] deep cuts in rock muskeg, and areas of severe frost action.[16] [17]

Despite the problems of permafrost, frost action, wet summers, heavy snowfall in winter, a cold climate and adverse conditions of terrain including muskeg, sensitive clays, rock cuts, and a shortage of good materials of construction, the railroad is functioning satisfactorily and iron ore is being mined and transported to Seven Islands and then to the steel mills at a steadily increasing rate. This

14. Woods, K. B., Pryer, R. W. J., and Eden, W. J., "Soil Engineering Problems on the Quebec North Shore and Labrador Railway" Bulletin 549, Vol. 60, American Railway Engineering Association, p. 669–688, February 1959.

15. Pryer, R. W. and Woods, K. B., "Investigation of Banded Sediment along St. Lawrence-North Shore in Quebec," Special Technical Publication No. 239, American Society for Testing Materials, 1958, p. 55–70.

16. Monoghan, B. M. "The Location and Construction of the Quebec North Shore and Labrador Railway" Engineering Journal, Vol. 37, No. 7, p. 820–828, 1954.

17. Pryer, R. W. "Frost Action and Railroad Maintenance in the Labrador Peninsula," Bulletin 218, Highway Research Road, 1958.

production will soon be supplemented by ore from the Lake Carol project to the south and west of Schefferville and joined by rail with the QNSLR.

CONCLUSION

The foregoing pages describe a period of northern development in North America without precedent. The North is being developed in a way never previously seen. It will be clear that all northern development is dependent entirely upon adequate transportation facilities.

Although there is an international boundary between Alaska and the Yukon Territory, the pattern of change is the same in both Canada and the most northerly United States. A significant symbol of this changing scene is the great grain elevator recently completed at the small port of Baie Comeau on the north shore of the Gulf of St. Lawrence. Both authors of this article have seen this small port develop into an industrial centre of importance, with great aluminium and paper plants converged upon it.

Its grain elevator is an indication of its fortunate position with regard to winter navigation. Yet it is a token of the challenge the future presents to the opening up of previously isolated areas. There will be no grain elevators in the Arctic, in the foreseeable future. Other developments, however, notably in connection with mineral development, will result in the areas, as described in this article, becoming far better known than they ever were in the past.

EXECUTIVE EDITOR'S NOTE: In August, 1960, the U. S. atomic submarine *Seadragon* traversed the Northwest Passage near the 74th parallel from the Atlantic to the Pacific after a six-day trip of 850 miles on the surface and under water and ice. Commander George Steele II, in the *Seadragon*, broke through the ice at the North Pole where his crew played a baseball game, so a home run could travel from "today into tomorrow."

Accident Prevention in Arizona

ROBERT J. ALLEN

Mr. Allen has been the Executive Director of the Arizona Traffic Safety Foundation since it was established in 1959. Previously, he spent twelve years with the Association of Casualty and Surety Companies serving as Chief Traffic Engineer and later as Assistant Manager of the Accident Prevention Department. He also served as Director of Field Services for the Insurance Industry Committee on Motor Vehicle Accident's program of consultative assistance to New York State communities. He is a member of the Institute of Traffic Engineers and serves as Secretary of the Institute's editorial board currently revising the Traffic Engineering Handbook.

CO-ORDINATED co-operation between officials and citizen leaders is the keystone of the traffic safety movement in Arizona.

Through this approach, the Arizona Traffic Safety Foundation and the Governor's Traffic Safety Co-ordinating Council provide leadership that will result in a greatly improved traffic safety record in this state. Although both the foundation and the co-ordinating council are infants compared with most traffic safety organizations in the country, they hope to set a pattern of effective action that could serve as an example for other states to consider.

Through co-ordinated co-operation on all fronts, the two groups are striving to transpose Arizona's traffic record from one of the worst in the nation to one of the best. To this end, both organizations are working closely and actively on a comprehensive state action program adopted by the co-ordinating council.

OFFICIAL STRUCTURE

The Governor's Traffic Safety Co-ordinating Council comprises seventeen state officials having direct and indirect traffic safety responsibilities. It was created under the leadership of Governor Paul Fannin in April 1960. Formal by-laws were adopted in July. As its name implies, the basic function of the council is to co-ordinate the traffic safety activities of all state agencies so that each can work co-operatively in the same direction towards common goals.

This co-ordinating structure makes possible the fixing of respon-

sibility and the outlining of procedures for achieving teamwork among the departments and agencies concerned. It provides the opportunity for collective discussion of all aspects of the problem necessary for sound policies and unduplicated effort. This co-ordination does not lead to a loss of authority, prestige or identity of any individual department or agency. It does make possible a total achievement far greater than the sum of the individual efforts.

Members of this co-ordinating council include the governor, the chairman of the highway commission, the president of the senate, the speaker of the house, the chief justice of the supreme court, the attorney general, the chairman of the corporation commission, the chairman of the commission of Indian affairs, the superintendent of public instruction, and the heads of the following state agencies: Labor Department, Liquor License and Control Department, Agriculture and Horticulture Commission, Health Department, Highway Patrol, Motor Vehicle Division, Engineering Division and the Traffic Safety Division.

The governor serves as the council's chairman, and the chairman of the highway commission serves as vice chairman. Also a full-time staff secretary with important administrative responsibilities has been assigned to the co-ordinating council by the highway commission.

CITIZEN-SUPPORT ORGANIZATION

Meanwhile at the citizen level, the Arizona traffic safety foundation is an independent, autonomous, self-governing organization devoted solely to the prevention of traffic accidents on the streets and highways of Arizona. It is a non-partisan, non-profit, statewide public service foundation independent of any governmental affiliation and privately financed by Arizona business and industry. The foundation is the first statewide citizen-support organization directly established under the auspices of The President's Committee for Traffic Safety.

Incorporated on July 29, 1959, the foundation's initial efforts were directed toward encouraging and assisting state officials in the formation of the co-ordinating council. The foundation took the position that a formal structure for co-ordinating official state action was essential for a truly effective and lasting traffic accident preven-

tion program, and that a close partnership of co-ordinated official action and organized citizen support was the only sound approach to the problem.

As a result of considerable study and numerous discussions between foundation leaders, the governor, and key state officials, the council was created in the Spring of this year. It immediately began functioning with the foundation in a joint move on Arizona traffic accidents.

The governor made it clear when he created the council that it was not his personal committee. He emphasized that the official traffic safety program in Arizona should at all times be kept free from personal, vested or partisan considerations. He pointed out that the council was under the auspices of the governor's office merely to insure its being a continuing committee fully representative of state government.

DEVELOPMENT OF A STATE ACTION PROGRAM

The council first developed a comprehensive, balanced official action program for Arizona. The governor, prior to creating the council, secured the approval and co-operation of the highway commission in having the four state officials directly responsible for enforcement, education, engineering, and motor vehicle administration serve as a special research committee.

This committee, established in October 1959, was asked to make a critical self-appraisal of all aspects of Arizona's traffic safety program. The committee was requested to use for comparison the immediate needs and long range objectives delineated in the report of the public officials traffic safety conference held in Washington, D. C. in December 1957 under the sponsorship of The President's committee for traffic safety.

The detailed report of the research committee was completed in March 1960. Its contents provided a starting point for the program of the council. When the council came into existence, all of its members were asked to present their views on steps that could be taken to improve Arizona's traffic safety program. And, on that basis, an initial state action program was evolved. This was unanimously adopted by the council at its monthly meeting in May 1960.

TABLE I—ARIZONA'S STATE ACTION PROGRAM

ADOPTED BY THE GOVERNOR'S TRAFFIC SAFETY CO-ORDINATING COUNCIL

EDUCATION

Immediate:

1. Provide formal training for drivers of state-owned vehicles.
2. Expand elementary school pedestrian and bicycle training program.
3. Propose state financial aid for behind-the-wheel training in public high schools.

Intermediate:

4. Foster expanded formal adult driver training programs.
5. Qualify teachers for traffic safety education.

Long Range

6. Foster establishment of a highway safety center.
7. License and regulate commercial driver-training schools.

ENFORCEMENT

Immediate:

1. Join with other state agencies in applied research on treatment of high accident locations.
2. Establish selected systematic highway-check activities.
3. Make more effective use of warnings in the driver control program.
4. Make maximum use of radar and unmarked cars.

Intermediate:

5. Propose establishment of a state-wide damaged-vehicle release sticker program.

Long Range:

6. Determine manpower, housing and equipment needs.

MOTOR VEHICLE ADMINISTRATION

Immediate:

1. Strengthen and publicize point system.
2. Circularize courts and law enforcement agencies with list of license suspensions and revocations.
3. Charge written warnings to driver's record in point system.

Intermediate:

4. (In view of the shortage of help), study advisability of TEMPORARILY suspending routine re-examinations for operator's licenses to release personnel and equipment for more intensive initial behind-the-wheel road tests.
5. Expand driver license examination techniques for initial and clinical examinations.
6. Expand training of licensing and supervisory personnel.
7. Determine adequacy of manpower, supervision, facilities and salaries.

Long Range:

8. Establish periodic vehicle inspection system.

ACCIDENT RECORDS

Immediate:

1. Establish a central records bureau for driver and police reports of accidents. A—Properly staff and equip to process and analyze reports and to provide regular summaries and necessary special-studies reports.

ENGINEERING

Immediate:

1. Require adherence to requirements of the CONSTRUCTION SIGN MANUAL on all construction projects.
2. Require that all jurisdictions adhere to Uniform Traffic Control Devices Manual.
3. Review no-passing zone policy in the light of current car design and operational characteristics and with regard to driver viewpoint *when passing*.
4. Improve and increase marking and signing of speed zones.
5. Expand use of public information and educational signs.
6. Adopt a realistic basic absolute speed law in conformance with the Uniform Vehicle Code.
7. Adopt the provisions of the Uniform Vehicle Code with respect to yield signs.
8. Continue use of 1½ percent funds to update study of RR crossings at grade and other projects approved by the B.P.R.
9. Require the use of reflective material on all state equipment.

Intermediate:

10. Expand (a) service to, and (b) coordination with local jurisdictions in traffic engineering.

Long Range:

11. Encourage development of traffic operations training on a regional basis for state and local personnel having traffic engineering responsibilities.
12. Determine long-range manpower and equipment needs.

COURTS

Immediate:

1. Require state-wide use of uniform ticket and complaint as adopted by the Highway Commission.
   A—Above to be prepared and provided by the Highway Commission.
   B—Require both police agencies and courts to report dispositions.
2. Establish administrative supervision by the Supreme Court of all courts with traffic jurisdiction.

Intermediate:

3. Prepare Justice of the Peace manual.
4. Establish application of uniform minimum fine and bail schedules.
5. Establish a program of regularly held traffic court conferences.

Long Range:

6. Authorize the state to provide uniform traffic dockets.
7. Establish adequate minimum salaries and qualifications.

OTHER ACTION

Immediate:

1. Draft a model traffic ordinance which cities and towns can adopt by reference.
2. Establish a legislative interim committee to inaugurate a long-range comprehensive study of transportation functions and needs.
3. Institute a study of the legal aspects of the problem and develop a comparative study of the Arizona Code and its compliance with the Uniform Vehicle Code.
4. Expand enforcement of the provisions of the Corporation Commission manual as it affects intra-state vehicle operation.
5. Foster active program participation by Labor, Industry, Agricultural Interests, the Professions and Organizations.
6. Initiate a comprehensive educational program on the use of seat belts.
7. Communicate program objectives and planned activities.

The Arizona Action Program, shown in Table I, is divided into immediate, intermediate and long-range categories as dictated by priority of need and feasibility. Seven committees have been created within the council to develop practical ways to meet immediate needs. As soon as these are translated into action, the committees will direct their attention to intermediate and long-range goals.

AN IMPORTANT GOAL IS PUBLIC SUPPORT

As the committees of the council spell out the steps necessary for official needs, and appropriate action is begun by the state departments and agencies, the Arizona traffic safety foundation, working in close co-operation with the council, will undertake to build informed public opinion in support of the state program.

Concurrently with the creation of the co-ordinating council and its committees at the official level, the Arizona traffic safety foundation has been proceeding with the establishment of activity committees at the citizen level covering the areas of enforcement, courts, motor vehicle administration, engineering and safety education.

Membership on these committees will include representation from various interested civic, business and professional organizations and associations throughout the state, as well as individuals especially qualified in the particular area of committee interest. The state official responsible for the area of committee concern is being asked to serve in a technical advisory capacity as an ex-officio member of the appropriate committee. For example, Greg O. Hathaway, Superintendent of the Arizona Highway Patrol, serves as an ex-officio member of the traffic law enforcement committee; and Fred C. Struckmeyer, Jr., chief justice of the Arizona supreme court, is an ex-officio member of the traffic courts committee.

These activity committees will be responsible for studying official traffic safety needs at the state, county, and municipal levels, and for developing means of stimulating public understanding, acceptance of, and support for the needed measures.

In addition, based on their independent study of the various aspects of the traffic accident problem in Arizona, these committees will make suggestions to the co-ordinating council and county and municipal officials on additional needs in their respective official programs.

An excellent example of the co-ordinated co-operation practiced in Arizona was the recent special emphasis program over the July 4th holiday employing the two-color holiday alert—Traffic Condition Yellow and Traffic Condition Red. This had proved effective in other states. This now recognized and accepted theme, employed on the two prior holiday periods in Arizona, was used to identify the co-ordinated effort spearheaded jointly by the council and the foundation.

The program was launched by the governor through a special statewide radio and television hookup, on June 23rd, during which he outlined for motorists the leading hazards of holiday travel and advised that all enforcement agencies throughout the state had been asked to redouble enforcement efforts during the officially proclaimed seventy-eight-hour Condition Red holiday period. This marked the start of a continuing series of statewide news releases—issued in accord with a pre-arranged timetable, each covering the specific action to be taken by the individual state agencies as part of this specialized program.

DETAILS OF THE RELEASES

These releases covered direct operational and enforcement activities of the highway patrol, the corporation commission, the motor vehicle division, the agriculture and horticulture commission, and the liquor licenses and control department. They also covered specific action by other state agencies. The engineering division sent a letter to all road-construction firms working in Arizona asking that special precautions be taken to insure that no hazardous conditions be allowed to exist at construction sites; the Labor Department asked all unions to warn their members of holiday travel-dangers. The Industrial Commission requested that all 17,000 workmen's compensation policyholders ask their employees to be alert to holiday risks. And the traffic safety division issued a special release on holiday hazards.

These releases, augmented by special releases from the foundation, and from local sheriffs and chiefs of police, were scheduled throughout the Condition Yellow alert, which remained in effect from the morning of June 27th until 6:00 P.M. July 1st, and throughout the subsequent Condition Red alert, which ended at midnight,

July 4th. All releases pinpointed the action of the individual agencies, and tied their actions together as part of the statewide co-ordinated program jointly sponsored by the co-ordinating council and the foundation.

SPECIAL BROADCASTS

The releases pointed out that this holiday program was the beginning of a continuing statewide program—of which the public education phase would have as its theme for the summer the particular problems of fatigue in rural areas and "tailgating" in urban areas.

In addition to these strategically-timed news releases to all public information media, special broadcast copy was prepared by the Phoenix Advertising Club's governor's committee. Through their co-operation, spot announcements were provided to all radio and television stations in the state.

The *fatigue theme* was augmented through the use of highway signs and outdoor advertising. Artwork, created by a member of the Phoenix Advertising Club's governor's committee, was reproduced on four-by-eight-foot reflectorized signs by the engineering division of the highway department at the request of the council. Twenty-five of these signs were erected at border inspection stations and other places along the state highway right-of-way. In addition, the same design was reproduced on twenty-four-sheet outdoor billboard posters which were displayed at fifty-five locations throughout Arizona. The billboard space was provided as a public service by the four major outdoor advertising companies. The same design was also used for slides accompanying TV spot announcements.

WARNINGS FOR RODEO CROWDS

Arizona is famed for its rodeos and Indian pow-wows. Many occur over the July 4th holiday and attract large crowds. Special copy for spot announcements was also provided to the sponsors of these affairs for use as the gatherings were ready to break up and spectators returned to their cars.

Through a further co-operative effort, business and industrial firms were encouraged to tie-in their radio, television, and news-

paper commercial advertising with the holiday program, so that an added impact could be made on the motoring public.

Serving as program co-ordinator, the foundation assisted in the development, scheduling and distribution of all public-education releases by both official and citizen groups. Working on a carefully planned timetable, this permitted a day-to-day build-up for the program which reached its climax at the start of the holiday week-end.

The wholehearted co-operation of state, county and municipal official agencies, all segments of the public information media, and individual business and industrial concerns was outstanding in this first attempt at a completely co-ordinated, statewide special emphasis program. It set the stage for acceptance of a continuing public education program on a year round basis which should prove effective in building a climate of informed public opinion in support of greater traffic safety.

CONTINUING PUBLIC EDUCATION PROGRAM

One of the major foundation objectives is to conduct a continuous traffic safety educational program utilizing all available public information media, this activity to educate all citizens on safe driving and walking practices, their individual responsibility for traffic safety, and to build support for sound, official action. The foundation has turned to the public information media of Arizona for leadership, co-operation and professional guidance in developing and executing its public education program.

Each of the professional associations representing various segments of the media in the state has co-operated by appointing representatives to the Foundation's Public Information Committee. This committee, together with the recently established governor's committee of the advertising club, has been most helpful and co-operative in program planning, copy and visual material development, promotion of public service time and space for traffic safety education, and encouragement of commercial advertising tie-ins. This voluntary professional guidance is making for a continuing statewide educational program with strong public sales appeal and the ability to communicate the message. It is broad enough in its coverage to provide maximum public impact, and should prove

effective in building an articulate body of informed public opinion in support of increased traffic safety.

The overall program has many added facets. The same comprehensive approaches, using all available public information media, as in the holiday program, are to be employed throughout the year in communicating safety awareness to the public, whether for individual responsibilities or support for needed official measures. A thirteen-week trial series of one-column newspaper mats covering various aspects of traffic safety was recently started to determine the response of the newspapers—particularly the many weeklies in Arizona—in using this type of material. The initial response has been very encouraging.

SPEAKERS' KIT WIDELY DISTRIBUTED

A pocket-sized speakers' kit will be distributed widely throughout the state to all who speak before different groups. Published as a do-it-yourself kit, it provides uniform, concise information on different phases of the traffic problem for use by officials and citizens alike when speaking in their own communities and circles.

Arizona's first Traffic Safety Seminar for Public Information Media Executives was sponsored by the foundation in June 1960. The seminar pinpointed the basic elements of the Arizona traffic accident problem, the co-ordinated approach being taken to control it, and the responsibility and role of the public information media in the statewide program. The governor and other top state officials participated and outlined their operations and needs. Representatives of the newspaper, broadcasting and advertising industries presented their views on the traffic problem and told what they could do to assist.

A twelve-page printed Reference Guide for Newspaper, Radio, Television and Advertising Executives was developed to spell out the media's responsibility and specific methods of participation in the statewide program. Media associations including the Arizona Broadcasters Association, the Arizona Newspapers Association and the Phoenix Advertising Club co-operated in encouraging representation at the seminar by their members, which helped account for its success.

Particular emphasis was placed in the seminar on the need for commercial advertising tie-ins with the traffic safety program in

Arizona by business and industry. The excellent participation in the July 4th holiday program which followed the seminar was a good indication of the tremendous potential that can be fostered in this area of public service contributions.

COMMUNITY CITIZEN ORGANIZATION

The foundation views its primary role as that of a catalyst to stimulate and assist in the co-ordination of the traffic interests and activities of all interested citizen groups so that they are directed toward specific priority needs. A basic need in Arizona is the creation of citizen traffic safety committees at the community level to spearhead the development of effective safety programs within the community where fifteen percent of the fatal accidents, forty-eight percent of the injury accidents and fifty-nine percent of the property damage accidents regularly occur.

Only one organized and staffed citizen group is functioning at the local level—the Maricopa Safety Council, a chapter of the National Safety Council, serving the metropolitan Phoenix area. There is a need for a full-time staffed citizen organization in the Tucson metropolitan area, and efforts are currently underway to realize this goal. The other communities throughout the state are not of sufficient size to support a staffed organization and will undoubtedly have to rely on a volunteer organization.

The foundation has prepared a special series of community traffic safety organization bulletins to guide the development and operation of local citizen traffic safety committees. These bulletins outline the elements of sound organization and the fundamentals of effective program planning. An endeavor is being made to enlist the aid of clubs and other groups to help bring community leaders and officials together for collective effort. Their leadership is needed to obtain the two basic prerequisites for an effective, non-partisan, local citizen organization that is fully representative of all major community interests:

1. A small key group of top community leaders who are sufficiently motivated to take necessary action; and

2. Community officials who want a more effective traffic program and recognize the need for a strong citizen organization to help achieve it.

Once this local leadership is secured, the foundation is equipped

to furnish detailed staff assistance in the community to provide the professional guidance and help necessary to set up a sound organization, and then provide continuing assistance to help the organization maintain its effectiveness.

ANNUAL INVENTORY AVAILABLE

Another approach to reach the goal of citizen organization at the grass roots level is the annual inventory of traffic safety activities administered by the National Safety Council. The foundation serves as co-ordinator of the inventory in Arizona and encourages communities to take advantage of this free appraisal of their local programs.

Six new communities were brought into this official stock-taking program during the early months of 1960. It is believed that the individual community written analysis will provide a valuable tool to help stimulate the creation of a local citizen traffic safety committee and an official co-ordinating structure similar to that now established on the state level.

Another statewide approach to furnish impetus to the creation of local citizen organizations is the voluntary vehicle safety check program sponsored nationally by the Auto Industries Highway Safety Committee. The foundation serves as co-ordinator for this program in Arizona and helped encourage a few new communities to take part during the May 1960 program. However, like any other program, maximum impact is only reached when it is conducted on a statewide co-ordinated basis. The Arizona Jaycees have adopted the vehicle safety check program as one of their traffic safety projects for the coming year and are currently working out plans for a broad, comprehensive program to be conducted in virtually every community of Arizona with co-operation of other civic organizations.

They have scheduled a series of four workshops in different sections of the state to train local Jaycee and other civic organization representatives in the conduct of an effective check program.

The medium of having a number of civic organizations work co-operatively on a local traffic safety project can help set the stage for their combining forces to create a fully representative, continuing communitywide citizen organization. The governor's traffic safety co-ordinating council, the auto industries highway safety

committee and the foundation work co-operatively with the Jaycees in building this statewide program.

Still another statewide approach and evidence of the co-ordinated co-operation between officials and citizens is the guidance and assistance provided for the Arizona teen-age traffic safety association by the foundation and the traffic safety division of the Arizona highway department. This statewide organization of high school students interested in traffic accident prevention is rapidly maturing and effectively working toward the formation of an active, student traffic safety club in every high school in Arizona.

OUTSIDE PROFESSIONAL ASSISTANCE

A new member has recently been added to the Arizona team of officials and citizens working together for increased safety in the vehicle—the insurance institute for highway safety. When the major automobile casualty insurance companies of the nation collectively joined forces last year to create the insurance institute, top state officials and citizen leaders in Arizona immediately co-ordinated their efforts to encourage the institute to select Arizona for their direct assistance program.

These efforts proved successful when the insurance institute announced in June 1960 that Arizona was one of only three states in the nation to receive their comprehensive program of continuing direct assistance. This assistance, to be provided as a public service over a period of several years without cost to the state, will consist of both detailed, professional technical help and limited grants in financial aid for specific traffic safety projects. The institute's professional staff has already initiated the assistance program in Arizona and is working closely in an advisory capacity with the governor's traffic safety co-ordinating council and the foundation to help a sound, balanced traffic safety action program.

OTHER PROJECTS PLANNED

Several other fundamental projects are currently on the planning board for joint endeavor by the council, the insurance institute and the foundation. The first of these is a three-day state traffic safety management course for all members of the council and their top assistants. This course, covering problems and methods in management of a unified state traffic safety program, is to be con-

ducted by the center for safety education of New York University, with the co-operation of the association of state and provincial safety co-ordinators, the automotive safety foundation, the Esso safety foundation, the insurance information institute, the insurance institute for highway safety and the national safety council.

It will be a modification—especially adapted for Arizona—of the basic state traffic safety management course provided for state safety co-ordinators throughout the nation in the past two years. This course is expected to be the first ever held in any state for all of the top state officials having traffic responsibilities and the first time a governor has ever fully participated in this extensive and educational course on traffic safety.

Also proposed for this fall is an Armed Forces-State traffic safety workshop. This type of workshop, started by the association of state and provincial safety co-ordinators and held successfully in several other states, is expected to prove beneficial in furthering the co-operative traffic safety activities of civil and military authorities. It represents still another basic step in the development of a fully co-ordinated, statewide traffic safety effort.

GROWTH OF THE FOUNDATION

Although the foundation is barely a year old, the years of painstaking study, evaluation and promotion required to make the organization operational are already beginning to return valuable dividends. The Arizona business and industrial leaders who gathered in Phoenix to incorporate the foundation in July 1959 fulfilled an idea conceived five years previously at the White House conference for highway safety in Washington, D. C. The businessmen who attended that 1954 conference immediately sought for Arizona an effective statewide citizen-support organization for traffic accident prevention that would be entirely privately financed, non-profit, non-partisan and completely independent of any governmental affiliation.

During the two years following the 1954 conference, these Arizona leaders met with top national authorities both within the state and at the 1956 regional conference in San Francisco of the President's committee for traffic safety to discuss plans for the formation of such an organization. Accepting the challenge this

presented, they made a beginning in 1956 when they formed the foundation's forerunner—the Arizona Citizens Traffic Safety Committee—for the purpose of working toward the creation of an adequately financed and staffed organization.

ANNUAL BUDGET OF $50,000

They first asked the President's committee for traffic safety to make a comprehensive study of Arizona's needs in this regard. This was done, and in 1957, the President's committee presented a detailed report on recommended objectives, operations, staff and financial requirements for a statewide citizen-support organization.

Armed with this report, the Arizona citizens traffic safety committee worked diligently for the next two years to obtain the interest and financial support of more of the top businessmen. During this extended and sometimes frustrating period, these business leaders stood firm behind the President's committee recommendation that pledges must be obtained for a minimum initial period of three years to permit the organization to complete its permanent structure and firmly establish its value.

When two-thirds of the recommended minimum annual budget of $50,000 was in hand for the first three years, the Arizona Citizens Traffic Safety Committee was formally incorporated as the Arizona Traffic Safety Foundation, and the writer was appointed executive director to make the organization operational. Read Mullan, a prominent Arizona automobile dealer who had been the leader in this movement during the preceding five years, was unanimously elected the first chairman of the foundation.

At the same time, the first board of directors and advisory board were elected—reading like the Who's Who of Arizona business and industry. Initial operations began with a staff consisting of the executive director and an office manager. In December 1959, the remaining two authorized staff members—an assistant director and a stenographer—were appointed.

The foundation is proceeding slowly, but steadily toward the realization of a basic philosophy that co-ordinated efforts of official action backed by organized citizen support lead to traffic safety. The approach in Arizona follows that philosophy. We are confident that results will pay dividends—a reduction in traffic accidents.

Planning Adequate Transportation For Southern California

JOSEPH E. HARING

Dr. Haring is Assistant Professor of Economics at Occidental College and Research Co-ordinator for the Southern California Research Council. Under his direction the Council is preparing a report to be published late this year. Dr. Haring holds the doctorate in economics from Columbia University. His publications have appeared in the American Economic Review, Metroeconomics, Economica Internazionale, *and* El Trimestre Economico. *He has an article forthcoming in* Airports and Airport Engineering *on airports for the Southern California metropolis.*

NO LESS than twelve official, sometimes conflicting governmental reports about transit in Southern California were published since 1953. And interested individuals' public pronouncements and proposals are legion. The result is a considerable amount of confusion and indecision on the part of responsible civic leaders.

The Southern California Research Council has taken on the task of sifting the millions of words to define a rational approach to transportation planning in Southern California.[1] "An Orderly and Efficient Transportation System for the Southern California Metropolis" is the title of the report to be published later this year.[2]

SCRC BEGINS RESEARCH

The need for such a study became imperative recently because of: (1) the confusing flood of reports about monorail and freeways; (2) the rapidly increasing automobile congestion on the freeways and streets of Southern California; and (3) the fear of economic strangulation if the roads, streets and other transport facilities of

1. The Council, jointly sponsored by Occidental and Pomona Colleges and thirty-five distinguished business firms in the area, has published seven reports since 1953 on subjects concerned with specific problems of the Southern California economy. Its latest report, entitled "The Southern California Metropolis—1980," was released early this year. SCRC is affiliated with the College-Community Research Center Program and is in part financed by the Committee for Economic Development and The Fund for Adult Education of the Ford Foundation.

2. Los Angeles, Orange, Ventura, Santa Barbara, San Bernardino, Riverside, San Diego, and Imperial Counties make up Southern California for purposes of this study.

the area become too congested to permit efficient movement of goods and people.

SCRC began its research work by comparing carefully all the available public and private reports on transportation in Southern California. Monorail reports, freeway extension statements, plans for new freeways and new street facilities, and national and statewide policy statements on transportation planning were studied.

This mass of printed material prompted an interview survey of the top businessmen and government planners in the area and at the national level. Civic leaders were asked to consider the strengths and weaknesses of Southern California's transportation system and transport planning, and then were solicited for recommendations about improvement.

The third step was to condense the collected information into concise statements of fact and policy recommendations.

The council's findings can be grouped under three headings: (1) Southern California's expected growth; (2) Southern California's transport requirements; and (3) public planning and organization.

SOUTHERN CALIFORNIA'S EXPECTED GROWTH

Southern California is expected to nearly double its population between 1960 and 1980, increasing from nine million to seventeen million in the next two decades. By far the largest portion of this increase will be absorbed by Los Angeles County, which is to receive nearly four million persons in addition to its present six million. Adjacent Orange County is expected to have the largest relative increase—nearly two million residents are to join the present 700,000.[3]

Residential living habits are expected to reflect dispersion tendencies as in the last two decades: single-unit dwellings will house most of the expected population increase. Outlying areas, where the cost of housing is cheaper, are likely to develop rapidly.

There are several reasons for the growing dispersion of residences, commercial establishments, and industrial facilities. The primary

3. The population and income projections of this section have been developed by the Council in its "The Southern California Metropolis—1980," Southern California Research Council, Los Angeles, 1959, pp. 8 ff.

cause is the desire and ability to pay for suburban-type living. Midwesterners who come to Southern California are accustomed to single-unit homes, and immigrants from the densely populated eastern seaboard may relish the opportunity to avoid apartments.

A widely-dispersed labor force requires large parking lots at factory sites, so industrial planners are placing their new establishments in the outskirts of cities, where land is cheap enough to permit adequate parking lots. That is a second reason for dispersion.

Third is the huge land requirement of many of the leading manufacturers of Southern California: aircraft, missile, and some electronics firms find single-story buildings with long production lines by far the most efficient. These firms cannot afford to locate in high-priced central business or manufacturing districts.

Finally, dispersed factory locations often provide congenial

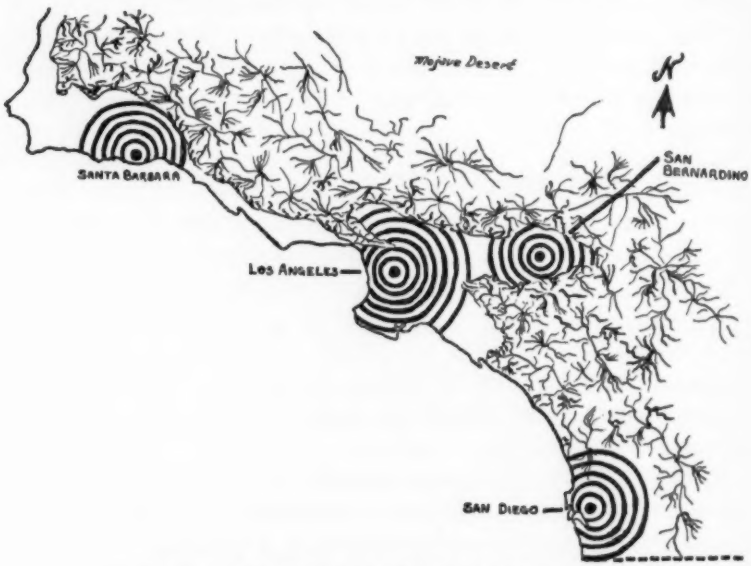


Figure 1. The Southern California Metropolis.

working facilities for valuable workers, and industrial firms allow this factor to influence their choice of site.

Growth patterns are expected to continue to reflect concentric expansions around the central business cores of Los Angeles, San

Diego, and San Bernardino-Riverside, with the circles meeting and crossing as the outer reaches of one community melt into the outer reaches of another. Figure 1 illustrates this pattern of expansion in graphic form.

The three population centers of the area are alike in that dispersion of population and industry is likely to continue in a concentric pattern, but Los Angeles is different in that it is growing up (in population density) as well as out because of the growth of centralized commercial and financial facilities in the central business district and along the Wilshire Corridor.[4]

The Wilshire Corridor, extending from the center of Los Angeles (CBD) westward along Wilshire Boulevard, appears to be developing into a business and finance center for the area. Multiunit apartments a block or two to either side of the Boulevard provide residences for many of the white-collar workers employed in businesses on Wilshire. Population densities along the corridor are increasing rapidly, making the area a major exception to the general growth pattern in Southern California. Other areas of relative high density are Santa Monica, southwest of the Wilshire Boulevard and Western Avenue intersection; and to a lesser extent, Pasadena, some twelve miles northeast of the central business district.

Southern California has developed considerable engineering technology in its aircraft, missile, electronics, and research industries, among others. Further growth is expected to occur in the same types of "sophisticated" industries widely scattered in the area.

TRANSPORTATION REQUIREMENTS

Because of growing dispersion of population and industry, automobiles will continue to provide the most economical mode of transportation in the region's foreseeable future. The freeway system, the central portion of which is outlined in Figure 2, has provided transport links to the outer reaches of the Los Angeles Basin. Its planned expansion (indicated by dotted lines) is designed to become a transport grid that will greatly increase the potential growth of the area.

4. More than seven million square feet of new office space have been constructed in the Corridor during the last six years.

VENTURA COUNTY
LOS ANGELES COUNTY
San Fernando
GOLDEN STATE FWY.
Tujunga
Reseda
Van Nuys
Burbank
VENTURA FREEWAY
HOLLYWOOD FREEWAY
SAN DIEGO FREEWAY
Hollywood
Beverly Hills
SANTA MONICA FREEWAY
Santa Monica
Culver City
Venice
Inglewood
HARBOR FREEWAY
INTERNATIONAL AIRPORT
Hawthorne
El Segundo
Gardena
Redondo Beach
Torrance
Palos Verdes Estates
San Pedro
FREEWAY SYSTEM
in the
Los Angeles Area
as of May 1960
scale in miles 0 1 2 3 4
LEGEND
Freeways
completed
under construction
Expressways
completed
under construction
Expressways or Freeways
budgeted
route adopted
Los Angeles Central Business District

N
W
E
S
Pasadena
Monrovia
Azusa
Alhambra
Covina
El Monte
SAN BERNARDINO FREEWAY
Pomona
Ontario
POMONA FREEWAY
Montebello
Whittier
Vernon
Bell
SANTA ANA FREEWAY
LONG BEACH FREEWAY
Downey
LOS ANGELES COUNTY
ORANGE COUNTY
SAN BERNARDINO COUNTY
Norwalk
Compton
Bellflower
RIVER
Yorba Linda
Fullerton
Buena Park
Lakewood
SAN GABRIEL
Anaheim
SAN DIEGO FREEWAY
Orange
NEWPORT FREEWAY
Long Beach
Westminster
Seal Beach
Santa Ana

Figure 2.

Financing for the freeway program is assured by the State of California through gasoline tax and automobile registration fee laws. Divisions VII, VIII and XI of the state division of highways are charged with planning and constructing the freeway system as tax monies become available. The freeway system is expensive in both land and construction costs, but for widely-dispersed populations it is still more economical than any other form of travel known in Southern California today.

Figure 3. Rapid Transport Corridors and Transport Centers in Southern California.

Mass rapid transit for the Los Angeles Basin is being studied by the Los Angeles Metropolitan Transit Authority (LAMTA), a public corporation created by the state legislature to provide mass transit in Los Angeles and Orange Counties. LAMTA has engaged engineering firms to make detailed recommendations for fixed-location (rail) transportation of passengers. The most recent proposal recommends a four-armed, seventy-five-mile system feeding the Wilshire-CBD commercial corridor. Figure 3 indicates the proposed routes. Consulting engineers estimate that the system, an overhead duorail, would cost $529.7 million. Estimates of expected revenues are yet to be developed.

However, preliminary origin-destination studies by engineering consultants to LAMTA indicate that the Santa Monica-Wilshire-CBD corridor has a larger number of potential riders than any of the other suggested transit routes. Land values along this corridor are relatively high, so an overhead rail system, using relatively little land, may be capable of providing cheap transportation. Further studies of expected demand-and-cost schedules should provide more accurate evaluation of the economic feasibility of rail transit in this and other corridors.

LAMTA is now operating a single-rail transit line (to Long Beach), and several bus lines. Ninety-five percent of Los Angeles commuters find the present facilities unattractive, though the "Freeway Flyer" express bus service to the San Fernando Valley is gaining in popular acceptance, according to LAMTA.

Buses are by far the most flexible and convenient form of public mass transit, but their widespread use will require a special function of roadways for buses. One possibility is the construction of special new freeways for buses, on which express bus service could be provided for commuters. For example, buses could use local streets in suburbs to pick up passengers, proceed to the bus freeway, and then at high speed go directly to the business district.

The reverse pattern could be used for homeward trips in the evening. This service could be as fast as any proposed form of rail service, and would be much more convenient to passengers not living or working near rail stations.

Bus freeways might be built (by LAMTA or some other suitable agency) almost as cheaply as the "metro" duorail suggested by the Authority's consulting engineers.[5] Many new LA freeways cost half, or less than half, of the $5.9 million a mile of the proposed duorail. Special bus freeways are more versatile than rail facilities because they can be rented to motorists on a toll basis as well. Rush-hour commuters may be willing to pay a toll of one-half cent

5. These engineers estimate that the 74.9 miles of duorail system, exclusive of rolling stock, would cost $443.7 million, or $5.9 million a mile. The Colorado Freeway extension to the Golden State Freeway, perhaps typical because it transverses both densely and sparsely populated areas, is costing about $6 million a mile, or about as much as "metro," according to District VII of the California Division of Highways. Precise comparisons, of course, must await detailed engineering studies of the proposed routes and the available rights-of-way. *Cf.*, E. T. Telford, "Freeways in District VII," *California Highways*, Vol. 39, January–February, 1960, pp. 3–19.

a mile or more for the privilege of getting home thirty minutes sooner by using bus expressways; weekend vacationists might save considerable time and expense by paying for the privilege of driving on them.

TRANSPORT CENTERS NEEDED

Strategic to the development of satisfactory mass transit is a system of multi-purpose transport centers. Area transport centers could serve as collecting points for people and goods en route to more distant parts of Southern California by a variety of travel modes. Such centers would be economical where rail mass transit is to be used, because parking lots and feeder bus-connections required for adequate rail service provide a natural nucleus of cooperative service units. Adding helicopter and taxi service to the bus, parking, and freight-forwarding facilities around a rail terminal would increase the economies realized from joint solutions to transport problems.

A system of bus expressways, on the other hand, would tend to reduce the need for transport centers; a large one in the CBD (at Union Station, for example) might be able to serve the whole area for both passenger and freight purposes. Bus expressways would make it possible to tailor service to the many locations required without frequent changes.

In any case, the chief center is likely to be in the CBD hub, with auxiliary centers at transit extremities, as indicated on Figure 3. Union Station in downtown Los Angeles is already functioning in a small way as a hub, and Pomona has a multi-purpose transport center that might serve as a pilot operation for later developments. Los Angeles International Airport has great potential as a multi-purpose transportation center.

Central to this analysis, of course, is the assumption that population dispersion will continue to keep travel densities low, except along the CBD-Wilshire-Santa Monica corridor.

Sufficient population and industry dispersion tend to eliminate parking space problems, though Los Angeles' CBD-Wilshire corridor will continue to require considerable commercial parking space. Although a law has been passed requiring parking allocations according to expected occupancy of new buildings, there is little

evidence that new buildings are being planned without express consideration of parking requirements. Destruction of old buildings is in fact encouraged by real estate tax reductions on land so converted.

Freight movements in and around Southern California are largely handled by private firms. Rail, truck, ship, airplane, and pipeline companies compete with one another for the available business, though each mode of transport is constrained by a different set of regulations and subsidy patterns.

Railroad freight movements are constrained by Interstate Commerce Commission rate-change policies, labor union make-work schemes, and unimaginative management policies on the part of the railroads themselves.[6] Some truckers are regulated (interstate lines), but many are not; some truckers pay low fuel taxes by using diesel engines, some do not. Shipping is heavily subsidized by the United States government in some cases, and protected in others (coastwise shipping). There appears to be no consistent national policy regarding air freight; pipelines are also subject to ICC policy.

National policy changes regarding freight movements are required to correct many of the inconsistent practices found in Southern California as well as around the nation.

Los Angeles International Airport handled nine million passengers in 1959 and is expected to serve twenty million passengers in 1970, plus a considerably greater relative increase in air freight. The area will need another large airport early in the 1970's, and plans need to be laid now. No official action is being taken at the moment, but several interested private groups are exerting pressure toward this end.

PUBLIC PLANNING AND ORGANIZATION

The Council's findings on public transport planning fall into three categories: (a) some of the area's transport planning has been thorough, though primarily concerned with only one transport medium; (b) a sizeable portion of the planning seems to have been un-co-ordinated and short-sighted; and (c) much needed planning was not being done at all.

6. *Cf.*, J. R. Meyer, *et al.*, *The Economics of Competition in the Transportation Industries*, Cambridge, Harvard University Press, 1959, Chapter III, and *passim*.

The state division of highways, the Los Angeles metropolitan transit authority, certain county officials, the railroad companies with regard to property for industry, and the Long Beach and Los Angeles Harbor Departments have attempted thorough, long-range planning.

The state division of highways has developed a master plan for freeways and some local streets in Southern California, under provisions of the Senate Current Resolution 26 and subsequent legislation. Some 190 miles of freeways have already been constructed by this agency, which is financed in large part by gasoline tax and vehicle registration revenues collected by the state. More than 1,000 miles of additional freeways are planned for District VII of California which includes Los Angeles, Orange, Ventura, and parts of Riverside and San Bernardino counties.

In co-operation with the traffic department of the City of Los Angeles, the state highway engineer for District VII is currently engaged in an area-wide origin-destination study of transport needs. "The Los Angeles Regional Transportation Study" is expected to be completed early in 1962. Representative state (including LAMTA), county and city officials of the area have been invited to act as an advisory committee to this project.

The planning of the state division of highways concentrates on freeways and major expressways—its chief responsibility. Limitation of its responsibilities in the past has precluded detailed consideration of the role of mass rapid transit, rail, monorail, or other transport modes.

The Los Angeles metropolitan transit authority concentrates exclusively on the problem of mass rapid transit for Los Angeles and its immediate environs. The Authority foresees considerable development of mass transit in and around the central business district, with spurs going some distance into the suburbs. Financial and legal limitations prevent LAMTA from making an extended overall plan of freeways, freight movements, pipelines, and air travel. By choice it has not examined bus expressways as rapid transit possibilities.

Planning by county officials has been forward-looking but under-financed. Los Angeles County has by far the most promising planning unit in its regional planning commission which attempts to study land use for regions within the county. Inter-county co-

operation has been promoted by the Los Angeles regional planning commission, with but sporadic success. In 1958, an inter-county planning group engaged in a regional recreational study for eleven counties in Southern California,[7] but study has lagged because of insufficient funds.

The three major railways in Southern California—Santa Fe, Southern Pacific, and Union Pacific—have purchased or leased land adjoining their rights-of-way that would be suitable for industrial sites. This is a thoroughly desirable form of land-use planning. It is not, unfortunately, being integrated into the rapid transit or freeway system development plans made on a continuing basis by LAMTA and the state division of highways.

Planning by the Long Beach and, to a lesser extent, the Los Angeles Harbor Department, has been comprehensive. Their plans integrate growth of freight and passenger movement with the expansion of the freeway system in Southern California. By connecting the Port of Long Beach and the Southern California freeways system, cargoes can be moved from any pier in the port area directly onto the Long Beach Freeway and to all points in Southern California. The Los Angeles Harbor is attempting to develop similar facilities.

RESULTS OF UN-CO-ORDINATED PLANNING

Examples of apparently un-co-ordinated planning include: (1) that done for the roads around the new International Airport; and (2) the placement of freeway entrances and exits in the downtown area of Los Angeles.

Los Angeles International Airport is a giant $200 million installation that will be expanded and completed in 1961. The runways and hangars are excellent and the passenger and freight-handling facilities will be the most modern in the world. Traffic patterns beyond the edge of airport property are another matter, however. City officials have pointed out that in 1965 more than ten million cars are expected to move in and out of the new airport—almost 30,000 cars a day.

Unless new plans are developed, however, nearly all of these cars will have to pass the Sepulveda-Century intersection near the airport entrance. This intersection is already the busiest in Southern

7. Including Kern, Inyo and Mono Counties in addition to those under discussion in this article.

California by actual count. The city Department of Airports predicts a 350 percent increase in air traffic by 1970, but that department has no authority beyond the airport to alter street, freeway, or land transport around the airport.

At first blush one may be tempted to blame the airport planners. But the basic reason for this lack of planning is that no single agency has the authority for providing facilities to handle traffic to and from the expanded airfield. Federal, state, and city highway and road officials all are responsible for moving traffic from the airport.

Congestion on the downtown freeways in and around the famous four-level interchange is compounded by an excessive number of exits and entrances in close proximity. Traffic officials estimate that the flow of traffic could be substantially increased by eliminating or closing some of these exits and entrances, which were built for the convenience of those living or working nearby. Increasing acceptance of the idea that freeways are for long-distance (six miles or more) travel—not for local movements—will probably preclude similar planning errors in the future.

We come now to public transport planning that has been neglected: public regulatory agencies and most small towns and cities are outstanding examples of important economic forces which, by their own admission, do little or no long-range planning.

Public regulatory agencies (the Public Utilities Commission or the Interstate Commerce Commission) report that they have neither the staff nor policy responsibility required to make decisions about railroad tariff rates, pipeline transport rates, and the like, except on a day to day *ad hoc* basis that fits into no particular long-range transport plan at all. The federal government itself has complained about this lack of policy and authority, but as yet no action has been taken.[8]

Planning commissions for the 125 small towns and cities in Southern California spend from eighty-five to ninety percent of their time on changes in zoning and variance regulations, and have neither time nor authority to do long-range planning. In some of the communities the voting public has authorized them only to live with and maintain the status quo.

8. *Cf.*, U. S. Department of Commerce, *Federal Transportation Policy and Program*, Washington, D.C., March, 1960, pp. 4 and 5 and *passim*.

It seems apparent that, operating all by themselves, many government units cannot afford the comprehensive planning needed for long-term growth in Southern California. A multitude of these small local governments exist in Southern California. Some 600 local government districts must make plans and decisions about transportation in the area. But by and large they have not been able to work together.

POLICY RECOMMENDATIONS

The transportation system in Southern California must, if it is to function adequately, provide transportation flexible enough to meet the needs of widely scattered population, businesses, and industrial plants and at the same time prevent congestion in the densely populated CBD-Wilshire corridor. Accomplishment of this goal will require close co-operation by state, regional (LAMTA has regional authority over Los Angeles and Orange Counties), county and city officials of the area.

Because the disjointed governmental machinery so far employed has not produced integrated planning, a need exists for a regional transport co-ordinating authority, similar to those provided for the San Francisco Bay area and the Port of New York area.

The regional transport co-ordinating authority should be required to perform two major functions. First, it should be charged with the responsibility of assuring adequate highway, rail, airplane, pipeline, and water transportation, consistent with the high rate of economic growth in the basin. This means that various forms of transportation must be jointly designed to complement each other in such a way as to provide the necessary transport at the lowest possible cost.

The second responsibility of the regional transport authority should be to arrange for the proper spacing of residential, industrial, commercial, and recreational areas so as to minimize unnecessary travel.[9]

9. SCRC is developing a recommended administrative structure for the proposed transport authority, and will publish their recommendations in a comprehensive report later this year.

Land Economics as the Basis for Sound City Planning

WM. H. CLAIRE

Mr. Claire is an Urban Renewal and Planning Consultant in Pasadena, California, and Western representative of Homer Hoyt Associates, Washington, D. C. He was formerly the Assistant Executive Director of the Community Redevelopment Agency of the City of Los Angeles. His professional work was largely with consulting engineers and architects in Chicago, Denver, and Los Angeles before joining the staff of the Redevelopment Agency in 1951. Mr. Claire holds a B.S. degree in Architectural Engineering. He is a member of the American Institute of Planners, the Advisory Council of the Senior Citizens Association of Southern California, chairman of the Committee on Urban Renewal of the City Planning Division of the American Society of Civil Engineers, and an associate member of the Institute of Traffic Engineers.

INTERCITY freight-traffic trends show that rail declined from seventy-six percent of the total ton-miles handled in the United States in 1926 to forty-six percent in 1959; trucks handled an increase from three percent to twenty-three percent during the same period.

In 1956, for the first time in Los Angeles history, new multiple dwelling units exceeded single family dwellings.

Several community shopping centers in the country are losing business to larger regional shopping centers in the vicinity.

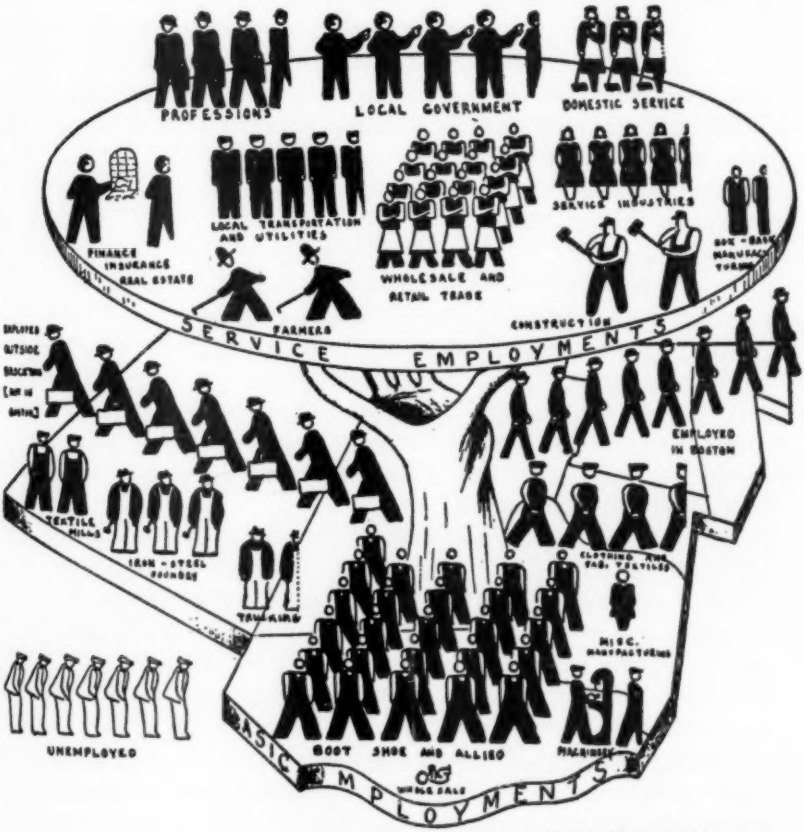
The potential increase in land values, through redevelopment of blighted areas near freeways taking full advantage of the convenience and time-saving qualities of these traffic arteries, is not being realized.

These four apparently unrelated facts have in common the relationship between city planning and land economics—two disciplines that complement each other in the search for a method of guiding urban growth in an orderly, sensible, and profitable manner.

City planners through recent decades have rightfully emphasized, in formulating city plans, the living amenities or livability of the urban area. This we need and will continue to need. How-

ever, much planning is not favored with sufficiently widespread support to be officially adopted, let alone implemented. What is the basis for resistance or fear on the part of planning commissioners and municipal legislative bodies concerning creation and adoption of a general plan for a community?

Could it be their lack of confidence in a general plan? Fear of too much control? An attempt to avoid change? If the plan were



Courtesy Homer Hoyt Associates

Figure 1. Basic and Service Employments, Brockton, Massachusetts, Economic Area 1946. (Each 1.225 Basic Jobs Support 1.0 Service Job.)

based on a solid foundation of land economics, confidence could be engendered, the right type of controls would be welcome, and property owners, investors, industry, and business would all benefit from a gradual, progressive change-over to the kind of city embraced in the general plan—the kind of city the people of the city want.

ANALYSIS OF THE ECONOMIC BASE

One of the important contributions the land economist can make to the city plan is an analysis of the economic base. A realistic analysis of this type requires a broad comprehension of the cause and effect of commercial and industrial successes and failures. This acumen provides for the land economist the judgment necessary for anticipating the number of basic and service employments the community will support ten or twenty or more years in the future.

Figure 1 shows how basic employments supported service employments in Brockton, Mass. in 1946.[1] A projection of such economic data gives the planner a realistic basis for his population forecasts, and woe be to the planner who is content with merely continuing a line on a graph extended from past population counts!

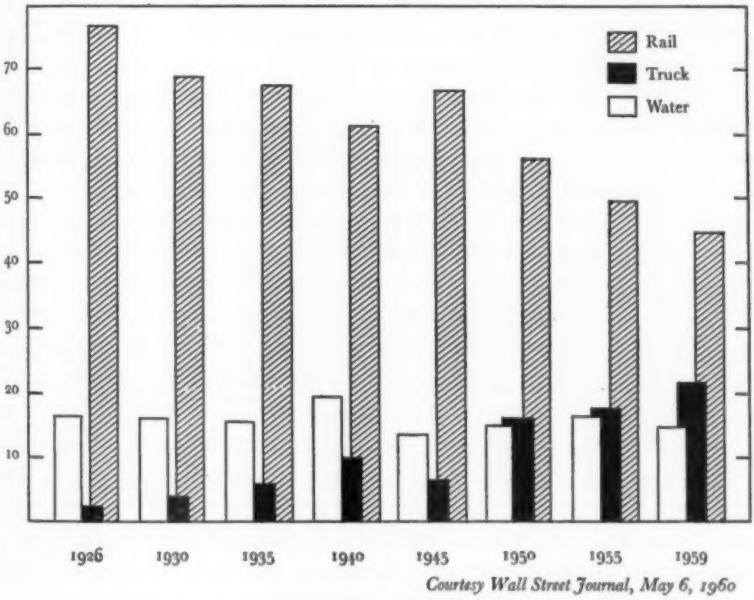
Why are we attracted to urban areas? It depends largely on our age. Children just follow their parents who seek opportunity, employment, security, and culture too—but are motivated mostly by economic reasons. Retired couples come for climate, convenience, passive activities, and in vastly accelerating numbers—an economic phenomenon in itself.

Population forecasts made from basic and service employment studies are then used to determine the areas required in the general plan for industrial, commercial, residential and other land uses. Densities and types of residential land uses are determined by family income, desire and custom. Then the planner applies the standards and principles of modern planning practice to these residential areas so that they may be efficient, safe, pleasant, and beautiful. The required community facilities are added to the land uses to plan for schools, parks, utilities, and the like. A communications system is then planned to connect these land uses with streets, highways, freeways, and transit routes.

1. The ratio between basic and service employments varies in each community and the Brocton ratio is therefore not necessarily typical.

The land economist can be of considerable assistance to the city planner in interpreting recent trends in urban transportation. In Figure 2, the *Wall Street Journal* in its issue of May 6, 1960, shows the effects of spending billions of dollars on highways in the country during the last several decades: Trucks carry about one-fourth of the intercity freight instead of the one-thirtieth they carried three decades ago. Rails, on the other hand, carry less than one-half; thirty years ago, they carried two-thirds.

What does this do to the general plan of the city? How can the land economist interpret this trend in terms of land values and land use?



Courtesy Wall Street Journal, May 6, 1960

Figure 2. Intercity Freight Traffic in United States.

One of the proposed redevelopment projects in the Los Angeles area required the study of its truck terminal operations. The experience of truck terminal operators in land-buying is worthy of note here. In their search for land areas sufficient for truck docks, storage, and maintenance, several large trucking firms went miles into the country where they obtained land at ten cents a square foot.

Some found that the daily cost of the extra haul from urban origins and destinations to outlying terminal locations soon cancelled out any advantage gained from the low land-cost. A few of these operators sold their outlying sites and willingly paid $2 or more a square foot for centrally located terminal sites, a cost retrieved in a matter of months from reduced operating expenditures.

The merging of several smaller trucking firms to provide a diversification of service, realize greater efficiency, consolidate less-than-truckload shipments, and generally to expand business, is a trend the informed city planner and land economist are studying. This trend required more space in the close-in industrial areas, greater use of already overloaded traffic arteries, and should be an important consideration in the land use and arterial elements of the general plan.

Even though the railroads are carrying a decreasing percentage of the total freight ton-miles between cities, they may be increasing in certain sections in total hauling. The planner would do well to check the railroads in his city to learn whether a certain portion of the freight yards, or an old freight or passenger station, or other little-used railroad property can be used for another purpose to the benefit of all. The land economist could help the planner in these determinations. Both should be aware of the effects on the city of the burgeoning piggyback (truck trailer on rail flatcar) operations regarding location, layout, land values, and highway connections of terminals.

Two other types of urban transportation are on the threshold of enormous expansion—ground and air transit. They both will relieve the costly congestion and delay we have experienced daily on city streets and now on overcrowded freeways. The land economist joins the engineer and planner in feasibility studies of these facilities and determines their extent—whether they should serve only the densely developed central areas or others too, and what economic benefits are to be derived therefrom.

TRENDS IN RESIDENTIAL DEVELOPMENT

This is one realm of urban growth where the planner and economist often disagree. The planner, in his desire for quiet, low-density, single-family home areas, has often placed an inordinate tax load on the community. Many planners avoid high-density

residential development as undesirable and unnecessary. But it is necessary and can be planned and built with desirability.

Most American cities are virtually built up—they have little or practically no vacant land left. Consequently, the only way left to grow is vertically. This can mean overcrowding, lack of sunlight and ventilation, inadequate parking and clogged streets, if realistic zoning controls are not in effect. The land economist can help the planner set controls on apartment development that will encourage a good quality of dwelling units and neighborhoods and still make the venture profitable to the investor.

A good example is the well-planned Park La Brea combination low-rise and high-rise apartments in Los Angeles shown in Figure 3. The street pattern allows complete ease of circulation of local traffic, yet discourages large volumes of through-traffic. Abundant landscaping and both passive and active recreational areas are planned into the layout. Parking is provided for in structures and conveniently placed surface parking areas. Tax revenues pay fully for public services rendered. Rents are set for a reasonable profit after payment of capital and operating costs.

Park La Brea was built ten years ago in a relatively outlying urban area. It is virtually impossible to assemble as much land as this in a vicinity close to the central business district. Yet this is where a demand exists for high-quality high-rise apartments, if an adequate area to create its own neighborhood entity could be assembled.

Such a site is possible through redevelopment of blighted areas near downtown where those who want to escape the strain and waste of time in daily commuting for hours each day can walk to work and live in a pleasant environment. We see this in several completed redevelopment projects in the country, such as the Park Plaza project in St. Louis, Lake Meadows in Chicago, Corlears Hook in New York, and Quality Hill in Kansas City.

The pressing need for developments like these presents an enormous potential for the future. The 1960 census shows a continuation of the suburbanization trends of the '40's and '50's, and this will obtain as long as decay of older areas of the city is allowed to continue. But there is a limit to the commuter's tolerance of traffic delays. The limit has long since been reached and the alternative is (1) to seek employment in smaller communities or the suburbs (probably at less pay); (2) find a good apartment close

to the large employment centers, or (3) development of an adequate rapid mass transit system.

Redevelopment of blighted central city areas into apartment complexes, coupled with the development of a modern transit system can solve this problem. The two programs complement each other in that they create markets or customers for each other, thereby assisting the economic feasibility of both. Residential development densities of around fifteen dwelling units to the net acre or less will gradually give way to higher densities in planned groups of apartments with densities well above a hundred units to a net acre.

These densities can be correctly planned for by the use of adequate standards and controls. Take traffic generation, for example; if eight vehicular trips daily per dwelling unit are normal for the particular development in the city under consideration (and this should be carefully investigated beforehand), traffic volumes can be determined and streets can be designed to accommodate these volumes.

The future of apartment living looks promising. The old objections to "life in a crowded flat" are overcome by modern planning. The convenience, simplicity, and economy of modern apartment habitation are increasing and attracting larger proportions of urban dwellers as the years go by.

SHOPPING CENTER TRENDS

Mushrooming shopping centers built in the '40's and '50's to attract large numbers of customers in the suburbs springing up around urban areas have reached a saturation point in some quarters. A close look at this trend and a few suggestions as to what we can do about it may prove useful.

Prior to World War II, for the most part in the entire country, there were two places to shop—downtown or main street, and the corner neighborhood grocery store. The automobile was recognized more and more as a market basket, and could bring people conveniently from long distances. Consequently, the modern shopping centers were built to attract this trade and the better ones were equipped with adequate parking, segregated truck service, and a clean, quiet, pleasant shopping atmosphere. They range in size

Steve Barrett, photographer, San Gabriel, California

Figure 3. Park La Brea Apartments, Los Angeles.

from neighborhood centers comprising from five to twenty acres, to community centers of twenty to fifty acres, and finally to regional centers of fifty acres to well over one hundred acres in a few cases.

However—and this is the point on which the planner and economist should work together—in some of the burgeoning shopping centers the relationship between supply and demand is not being adequately considered. The result is overbuilding. The effect is economic chaos. The owner of the neighborhood center sees a quick profit in converting to a community center and the community center owner in turn tries to convert to a regional center.

Then, if another large center is built within the retail trade area, and if that area does not grow sufficiently to supply the buying power needed to support the new center, something must give somewhere. Usually the neighborhood center continues to supply the daily needs of nearby residents and the regional center, with its greater variety of merchandise, attracts buyers at the expense of the community center.

Planners desperately need the guidance of an economist to avoid either an oversupply or undersupply of shopping facilities. One planner is in the process of formulating a general plan for his community and is trying to ascertain the number, size, type, and location of shopping centers the community will need for the next twenty years. He wants to base these decisions on an economic analysis of existing and proposed buying power and shopping facilities.

However, the city has a rigid policy of no outside consulting service, and since the required talent is not on the planner's staff to make the necessary economic analyses, the proposed shopping centers will be indicated in the future land use plan solely on a population projection basis. The spending habits of this population, competition of other shopping centers, the economic health of existing stores, the effects of building costs, taxes, and land values are all exigent in planning determinations and matters the economist can best analyze and synthesize for the planner in commercial land planning.

The city planner is responsible for selecting the general location and amount of land for various private and public land uses needed by the city in the future; then he formulates, or agrees with others

who formulate, plans for the inter-communication on pavement and tracks of persons and materials between these land uses.

The existing land uses in some cases may not conform to the proposed land uses adopted in a general plan, and also, these non-conforming land uses may contain several conditions of blight or deterioration in need of urban renewal. Furthermore, these same areas may have need for better communication with the rest of the city and this may be provided through freeways or transit facilities.

FREEWAYS AND RENEWAL PROJECTS

The land economist is by federal regulations a part of the urban renewal planning team where federal financial assistance is used. He is called upon to evaluate the land to be cleared and redeveloped in an urban renewal project. In this process he takes into account every effect on the value of the land, including available communications facilities, types of development in the vicinity, supply of and demand for improvements proposed in the urban renewal plan, and other influences.

The potential appreciation of land values of areas within easy reach of freeways and other communications media is of great proportion. Urban renewal of blighted areas near freeways is one way to take full advantage of this potential. It can help pay for the high first cost of freeways, transit facilities, bus and truck terminals, and other improvements required for city modernization.

The Hollywood Freeway in Los Angeles, the busiest "street" in the world, now carries more than 200,000 vehicles in twenty-four hours and passes through areas with various degrees of blight. One of these areas, the Temple Urban Renewal Project, is only a mile from downtown Los Angeles and is an excellent example of the co-ordination between the planner recommending needed facilities for the modern city, and the land economist providing the economic foundation to interest capital in financing these facilities.

Urban America is a huge, strong, growing thing. The mistakes of the past have left us with congestion, noise, dirt, delay, obsolescence and an unreasonably high cost of living and doing business in the city. Yet, the people demand more and more of the good life. The city continues to attract us to its churches, stores, cafes, jobs, business opportunities and colleges.

To change the urban environment to an efficient and esthetic one is a challenge. The inquisitive minds of the planner, architect, and engineer are constantly searching for solutions to the problems of urban living. Some of these problems are enormous and no small solutions will solve them. The answer lies in the co-ordinated efforts of many disciplines—city planning, land economics, architecture, engineering, public administration, finance, and jurisprudence. We know what the problems are and we know what to do about them.

There are vast accumulations of capital assets in the United States in numerous pension funds, oil fortunes, insurance companies, banks, real estate wealth, and other sources of money. Those responsible for profitably investing these funds are carefully testing various markets for these funds. These tests are meeting with success and success builds confidence.

The time for timid testing and tentative treatment of our problems is past. The time is here for trusting, daring, and doing urban development on an unprecedented scale. We have the brains, brawn, boldness, and bank account to make our cities the way we want them to be, and the work is already started in those cities with vision and leadership.

Neighborhoods and Traffic

OSCAR SUTERMEISTER

Mr. Sutermeister, consulting city planner and member of the American Institute of Planners, was planning consultant for the Lake Barcroft Community Association in Falls Church, Virginia. This followed neighborhood planning work for another Fairfax County, Virginia homeowner group, and the preparation of neighborhood base studies and two preliminary neighborhood plans for areas in Montgomery County, Maryland. He has served as consultant to the Baltimore Regional Planning Council; the Maryland State Planning Department, and the City of Rockville, Maryland. He is consultant to Dr. John Solomon of Bethesda, Maryland on long-range advance planning for the Cabin John Valley Regional Shopping Center in Montgomery County, Maryland; and to the Maryland State Planning Department for the Salisbury City Planning Commission and Wicomico County Planning and Zoning Commission.

THE nineteen-sixties will bring a large increase in family formation in the United States from marriages by the war babies of the forties.

The accompanying demand for additional dwelling units, reinforced by continued migration from rural to urban areas and continued concentration of urban growth in metropolitan areas, will produce a major enlargement of the urbanized fringe around existing metropolitan centers.

That enlarged fringe will consist of more than seas of single-family detached residences. The continuing influence of automotive transportation upon city structure will be evident in an increasing shift of major traffic generators to dispersed locations, including commercial centers to service outlying population and employment areas to draw upon the suburban labor pool.

DESIRABLE STRUCTURE OF METROPOLITAN REGION

Playing an essential role in making an urban pattern of dispersed generators workable will be metropolitan freeway systems, strengthened by or expanded from the urban portions of the national system of interstate and defense highways.

The major objective of comprehensive city planning efforts as

applied to expanding metropolitan regions has recently been defined as the achievement of an environment of maximum livability.[1]

The most important single factor affecting the livability of the physical environment is the character of the neighborhood in which an individual's home is located. Each house should be part of a specifically defined neighborhood. Each neighborhood should be specifically protected against the adverse influences of through-traffic and inappropriate land uses.

It should also derive its permanent attractiveness from such protections plus appropriate grouping of homes around a core of public facilities such as an elementary school and playground, or a school-recreation center. In addition, each neighborhood should be separated from the next by an obvious physical feature.

Most neighborhoods should be arranged in groups of various sizes, with each group related to other larger facilities, public and private, such as junior and senior high schools and planned major shopping centers, with each group separated from other groups by green spaces, and with smaller groups organized to form larger groups. A whole hierarchy of green space separators corresponding to the various size groupings of neighborhoods should be present to give form to the vast residential sections of a metropolitan region.

This pattern of a cellular structure of protected, designed neighborhoods may be sought in vain in many existing developed areas. It cannot be created automatically in newly developing areas through the normal processes of land subdivision. The only way to create and preserve permanently desirable neighborhoods is by developing and executing neighborhood unit plans and doggedly protecting each neighborhood against adverse influences.

PROTECTED RESIDENTIAL NEIGHBORHOODS

The policy alternatives available present a choice between continuous urban sprawl with frequently undesirable mixtures of land uses, and planned neighborhoods grouped into communities fringed with open space. The latter alternative is recommended as a basic planning objective for city and metropolitan regional comprehensive plans.

1. Technical Report No. 1, Baltimore Regional Planning Council, *Regional Land Use*, May, 1959, p. 34.

Traffic noise is the greatest source of blight to residential areas that exists in modern cities. To create and preserve the residential amenities that can be so easily destroyed by traffic, residential land should be divided into specifically defined neighborhoods that are protected internally and externally against foreign or non-neighborhood traffic.

A protected residential neighborhood should have no internal streets other than secondary residential streets and primary residential streets. These classes of road are officially known by various terms in different political jurisdictions, as, for example, secondary residential roads and primary residential roads in Montgomery County, Maryland, or local streets and local thoroughfares in Fairfax County, Virginia.

No federal highway or parkway, no state highway (whether interstate, federal aid primary, federal aid secondary, or federal aid urban), and no city or county arterial road, should penetrate a protected residential neighborhood.

The boundaries of a protected residential neighborhood may be formed by any of the above mentioned roads or by a green space, a railroad, or a buffered commercial or industrial district.

Within the boundaries of a protected residential neighborhood, the elementary school and any non-residential use which is only a minor traffic generator should be located on and obtain vehicular access from a collector street, not a local residential street. Any non-residential land use which is a major traffic generator should be located on and obtain vehicular access from a neighborhood boundary street of the higher types listed above, or else it should be located outside of a protected residential neighborhood.

While the location pattern of federal or state highways within a city or metropolitan region may be determined to a considerable extent by the geographic distribution of major traffic generators in the city, county or state, including commercial districts, industrial districts, early settlements and other cities and towns, the location pattern of city or county arterial roads, at least new ones, can and should be determined almost solely by an official local planning agency, whether city, county or metropolitan, with the advice and assistance of other arms of local government, and should be recorded in the local master plan or comprehensive plan.

The selected pattern of arterial roads should determine the number, size, shape and boundaries of protected residential neighborhoods within the city, and consequently the location, size and shape of unprotected residential remnants and of the larger nonresidential land use areas.

Simultaneously, the road pattern itself should be so designed, through study of alternative schemes and through adjustment to proposed land uses and densities, that it yields a series of neighborhoods each of which is within the proper size range, in terms of area, to yield over the long run an elementary school population appropriate to the size range of elementary schools desired by the locality.[2]

It is recommended that a local master plan of highways or major thoroughfare plan show and identify on the highway plan map each protected residential neighborhood, in order to insure and to inform the public that no arterial road or higher type highway will penetrate a protected residential neighborhood.

PRINCIPLES OF NEIGHBORHOOD PROTECTION

The overriding importance of good neighborhoods to achieving a livable environment emphasizes the great need for individual neighborhood plans which can be furnished to neighborhood residents and citizens associations as a working tool for carrying out neighborhood conservation programs.

Each of these plans should clearly state in text and incorporate in map form the following basic principles of neighborhood protection:

1. No through traffic within the neighborhood.

2. Adequate intersection capacity on the boundary thoroughfares to prevent any diversion of through traffic onto local streets because of peak hour congestion and delay at intersections on boundary thoroughfares.

3. Adequate buffering against traffic noise of residences located along boundary thoroughfares.

4. All foreign traffic generators, that is, destinations for non-

2. Attainment of this goal is hampered by many complicating factors, such as variations in density of land use, number of bedrooms and cost of homes, and life cycle of the neighborhood.

residential traffic originating outside the neighborhood, to be located on and served by boundary streets only, and to be buffered from adjoining residences. This category includes junior and senior high schools, community and regional parks, institutions, semi-public uses, and other public uses except elementary schools and neighborhood parks.

5. All local traffic generators with a greater use intensity than a group of row houses, and lying within the neighborhood, to be located on and served exclusively by a collector street rather than a local residential street, and to be buffered from adjoining residences. This category includes elementary schools, neighborhood parks, and apartments. (Large apartment projects might contain some internal local streets.)

6. Residences along collector streets to be buffered if collector street traffic will be heavy. The needed degree of buffering on a collector street can normally be accomplished with front yards deeper than those on local streets, or with a divided roadway. In either case, extra planting along the front property line or in the grass strip will be helpful.

7. The public elementary school to be located near the center of the neighborhood, with the school attendance district boundary coinciding with the neighborhood boundary.

8. A neighborhood park to be located adjoining the elementary school or in a boundary green space.

9. No incompatible land uses. In many neighborhoods, any semi-detached, duplex, row or apartment house would be incompatible with the exclusively single family detached house character of the neighborhood. In other neighborhoods, a mixture of these housing types would be acceptable but only under a specially approved, planned neighborhood design.

10. Reservation of sufficient additional right-of-way along boundary streets to permit later widening to carry future increase of through traffic, as the urban area expands, in accordance with city or county and regional master plans of highways, with the purpose of avoiding any future cutting of a new road.

The absence of any one of the above features means that blight has been designed and built into the neighborhood and will make its influence felt sooner or later.

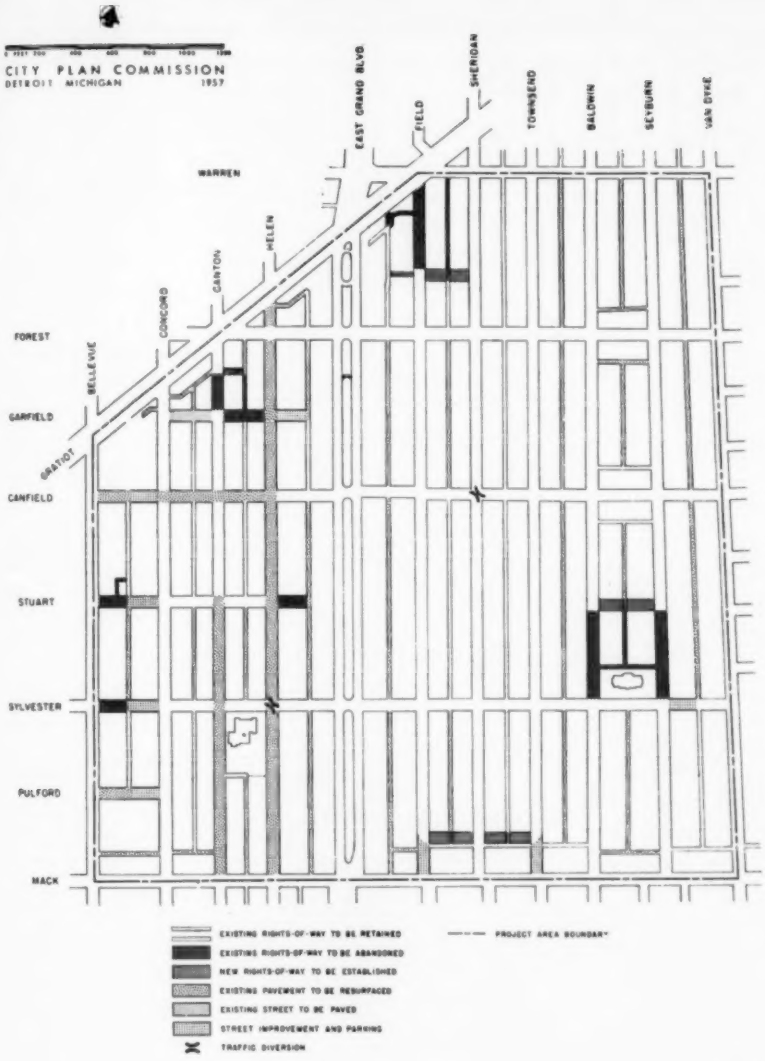


Figure 2. Street Adjustments Plan, Mack-Concord Conservation Project, Detroit, Michigan.

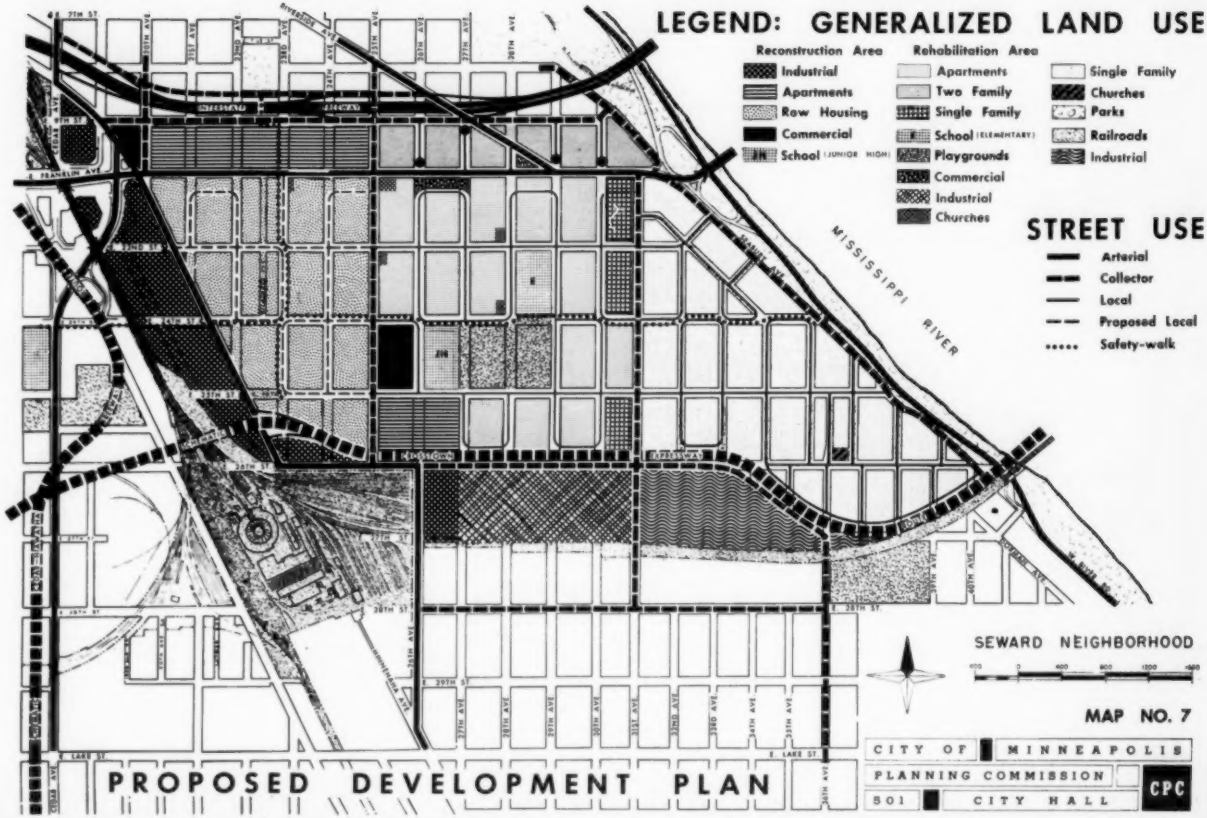


Figure 3. Proposed Development Plan, Seward Neighborhood, Minneapolis, Minnesota.

In laying out a pattern of neighborhoods within a community or planning area, the first requisite is to avoid crossing a highway or arterial road with a neighborhood boundary line. While this may prove impossible more often than not within an existing built-up area, it should be a primary objective in planning for new development. The master plan of highways should not be developed separately from a land use plan which identifies the boundaries of future stable, protected, residential neighborhoods.

NO THROUGH TRAFFIC

If the pattern of highways and arterials is already rigidly established and is incompatible with the designation of neighborhoods that are to be protected against through traffic, those residential areas which cannot be included within protected neighborhoods may be labeled unprotected residential areas or remnants.

Even when a neighborhood fits neatly into the pattern of major thoroughfares without being crossed by a thoroughfare, it may be exposed to the dangers of blight and decay, resulting from through traffic, because of the design of the neighborhood's internal street system.

In some cases, a street within the neighborhood, possibly a collector street but quite frequently a local street, may constitute a short cut for certain through movements, as compared with traveling around the perimeter of the neighborhood.

In other cases, congestion, particularly peak period congestion, at a critical intersection of neighborhood boundary thoroughfares may cause a diversion of through movements to internal neighborhood streets. This may be a short diversion around the intersection, especially for turning movements, or it may be a long diversion across the entire neighborhood to permit emergence on a different arterial route.

In the development of new areas, a number of design remedies are available for application to the internal neighborhood street pattern to discourage through movement. First, local streets should be curved, should use culs-de-sac, and should frequently terminate at T-intersections.

Secondly, the collector street pattern should be designed to encourage internal traffic to drain out of the neighborhood to the

Figure 3. Proposed Development Plan, Seward Neighborhood, Minneapolis, Minnesota

nearest boundary thoroughfare, rather than to provide straight quick access to all boundary roads, and from one boundary road to another.

The objective should be to provide a relatively traffic-free residential island, under a concept that is basically very comparable to the pedestrian shopping island concept used in planned regional shopping centers and in downtown revitalization schemes. Only those vehicles which must enter the protected preserve should penetrate the neighborhood. The truck tunnel of the shopping center, the emergency vehicle lane of the downtown pedestrian mall, and the local street of the protected neighborhood are brothers under the skin.

Subdivision regulations should be reworded to get away from the earlier concepts of minor street continuity in favor of protection of the interiors of neighborhoods against any traffic not having specific business therein.

In existing residential areas, the problem of through-traffic cutting across the neighborhood from one boundary arterial to another may be attacked with a variety of measures. The most positive of these is the diagonal barrier across a standard four-way intersection. The first example of this type of treatment known to the author is the barrier at Mulford Drive and Linden Avenue, Grand Rapids, Michigan, installed in 1951.

This first example was actually built as part of a new subdivision, but was needed to prevent one of the local subdivision streets from filling a gap in a potential bypass of a congested intersection. The inventor of this treatment, planning consultant Scott Bagby, then Planning Director of Grand Rapids, called the construction a street diversion.

Two years later, three similar street diversions were used in the Dickinson Conservation Area of Grand Rapids as part of a larger scheme which also included the sealing off of minor street entrances to the conservation area and the establishment of a buffer park between residences and industry. These three diversions were at scattered locations within the area and effectively prevented straight-through traffic on six different streets which had originally permitted through traffic to cross the entire area from one side to another.

These two examples of actual installations in Grand Rapids

were described by Mr. Bagby in an article in *Traffic Quarterly* for October 1954. The article, entitled "Protecting Good Neighborhoods from Through-Traffic Decline," is still the basic reference on this subject.

It contains Mr. Bagby's typical plan for a street diversion or diagonal intersection barrier and a street map of the Dickinson conservation area showing geographic relationships of the three intersections so treated.

The Dickinson area treatment was also written up in the *Saturday Evening Post* for April 21, 1956 in an article by Robert M. Yoder entitled "Revolt of the Homeowners." This article contains an actual photograph of one of the street diversions, that at Union Boulevard and Griggs Street. This is the only photograph of a street diversion known by the author to have been published in the periodical literature.

While the article was reprinted in quantity at one time, both the specific back issue of the *Post* and the reprint are now out of print, except for a few diazo copies recently reproduced by this writer by special permission of the Curtis Publishing Company.

Figure 1 shows the plan for pavement separation at Dickinson Street and Linden Avenue, as drawn by the City of Grand Rapids, Department of Public Service, Division of Engineering.[3]

The *Post* article of 1956 led to the recommendation of diagonal intersection barriers as a tool for improvement of existing subdivisions, in an article entitled "Subdividing for Traffic Safety" by Harold Marks published in the July 1957 issue of *Traffic Quarterly*.

Mr. Marks, as a traffic engineer, considered that increased traffic safety alone would justify the cost of both diagonal barriers and culs-de-sac located to block internal through traffic. The broader benefits—which he recognized as by-products—the present author would propose as the central justification from the beginning. Mr. Marks wrote:

"What has been accomplished successfully in one area can be applied elsewhere. Increased traffic safety would be a prime objective of this type of improvement but it would also have many desirable by-products. It is basically a new concept in urban re-

3. Furnished by Bernard J. Smith of the Grand Rapids City Planning Commission Staff.

development. Not only does it offer a method of protecting an older subdivision from traffic hazards and noise, but also from the resulting neighborhood blight, property depreciation, and loss of residential character and attractiveness."

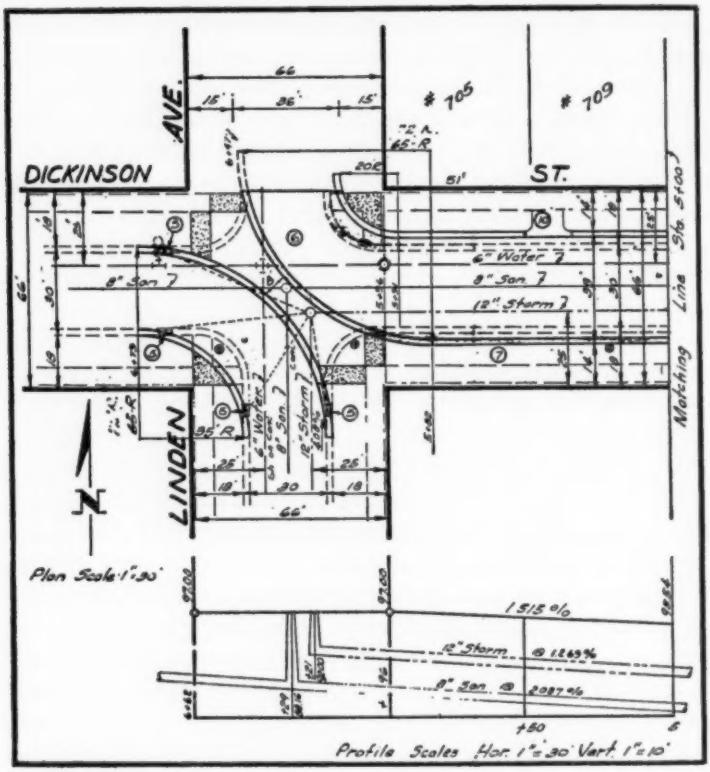


Figure 1. Pavement Separation at Dickinson Street and Linden Avenue, Grand Rapids, Michigan.

Another early reflection of the influence of Bagby's work is the 1957 proposal by the Detroit City Plan Commission to install two diagonal intersection barriers in the Mack-Concord Conservation Project area. After delineating residential neighborhoods for the entire city, Detroit planners selected neighborhood 6-E on the near east side for an urban renewal project (Michigan R-1).

In a carefully planned and comprehensive urban renewal project, reduction of through traffic on residential streets is only one of many conservation measures. For example, the Mack-Concord Conservation Project proposed the following types of action:

1. Removal of structures.
2. Establishment of recreation and greenbelt areas, partly through abandonment of existing rights-of-way.
3. Removal of non-conforming uses.
4. Removal of alley dwellings.
5. Establishment of industrial and parking areas.
6. Opening of new streets and alleys.
7. Construction of traffic diversions.
8. Street improvements including parking.

The street adjustments plan for the Mack-Concord conservation project is shown in Figure 2.[4] The plan calls for two street diversions which effectively block two of the three internal east-west streets in the neighborhood against through traffic.

A follow-on development flowing from the Grand Rapids and Detroit schemes is the proposed use in Minneapolis of a series of street diversions along a single street, resulting in the conversion of the street from a normal element in a gridiron street pattern to a series of base segments for U-shaped loop roads with alternate U's pointing in opposite directions.

An excellent example of this treatment is shown in the proposed development plan for Seward neighborhood, prepared by the Minneapolis city planning commission and published in October 1959 in No. 5 of its neighborhood series reports, entitled "Comprehensive Planning for the Seward Neighborhood."

Figure 3 shows the proposed development plan for Seward neighborhood. The key elements of interest to this discussion are the two "safety-walks," shown as a series of dots, and the existing and proposed local streets.

The safety-walk is a continuous pedestrian sidewalk running along an existing straight street for stretches of up to four blocks without interruption for vehicular cross-traffic. The sidewalk con-

4. Figure 2 is reproduced from *Neighborhood Conservation, a Pilot Study*, by Maurice Frank Parkins, Detroit City Plan Commission in co-operation with the Housing and Home Finance Agency, 1959, an urban renewal demonstration grant project and report.

tinuity is obtained by planning diagonal barriers at successive intersections, each oriented alternately at right angles to the preceding barrier. A pedestrian using the safety-walk would walk the first block on the right hand side of the street, cross an intersection on a diagonal barrier, walk the second block on the left-hand side of the street, and then cross the next intersection on another diagonal barrier which would take him back to the right hand side of the street. The safety-walk thus adds a bonus of pedestrian safety to the basic value of an isolated street diversion in preventing through traffic.

The proposed development plan for Seward neighborhood in Minneapolis proposes eight diagonal barriers at four-way intersections in a fourteen block stretch of East 24th Street.

A second safety-walk at right angles to the first extends for three blocks along 23rd Avenue and uses two diagonal barriers.

Since the proposed development plan located an elementary school, a junior high school and a large playground along the principal safety-walk, the traffic safety values of the series of street diversions is greatly enhanced because of the anticipated heavy use of the safety-walk by school children.

The Minneapolis safety-walk is very similar to the Philadelphia Greenway design as proposed by the Philadelphia City Planning Commission in 1954 in its Mill Creek Redevelopment Area Plan.

The 51st Street Greenway in the Mill Creek area uses diagonal barriers to separate traffic flows at four-way intersections, but the treatment is on a much more elaborate scale. Alternate block lengths of 51st Street are closed completely to vehicular traffic and converted to park area. These sections are replaced by demolition of housing under redevelopment powers and the opening of new alternate block length sections parallel to the old street some fifty feet away.

The vacating of portions of existing streets is another whole approach to preventing through traffic in protected residential neighborhoods. A large enough variety of street vacation patterns has been proposed to justify a separate report on this topic at another time.

In this paper we have presented the concept of a defined, protected and internally organized neighborhood, and have proposed

ten basic principles of neighborhood protection. The first and most important principle is protection against through traffic. Diagonal intersection barriers are an important means of preventing through traffic. Their use in neighborhood conservation and renewal planning is spreading and may be expected to increase as they become more widely known.[5]

5. Sears Roebuck and Company have recently given national publicity to street diversions in their 1959 booklet, "Citizens in Urban Renewal," prepared by G. Yates Cook, urban renewal consultant of Washington, D.C. Mr. Cook's sketches, on page 36, credit the Conservation Division of the Detroit City Plan Commission.

Taxes and New Road Estimates

ALLEN D. LEBARON

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READERS of *Traffic Quarterly* noted in E. H. Doubleday's article contrasting British and American traffic planning,[1] his main point that the United States lacks the legislation to make town and country planning dynamic and alive. That point is closely connected with the complaint of certain groups in this country about public lack of interest in planning.[2]

Mr. Doubleday's article also contained implied cricitism to the effect that our highway planning almost "runs away with itself." One is reminded of the frequent complaint that new highways often create more problems than they solve.[3] This is especially true in the case of architects who have criticized the general failure of co-ordination between highway development and town and country planning. Though many of these attacks are based on esthetic arguments, there is more involved here than the simple fear that over-specialization in favor of private automobiles will have undesirable long-run effects on America's social environment.

In addition, many people are understandably confused by the failure of some new roads to fulfill one of their avowed aims, the elimination of congestion. It is to this latter point that this paper is directed. Why *do* new roads often fail to solve congestion problems? This question merits some serious thinking. A partial answer re-

1. Ernest H. Doubleday, "English Planner Looks at U.S. Traffic," *Traffic Quarterly*, January 1960, p. 59.

2. The architects are possibly the outstanding example of these groups. Edgardo Contini, "Architecture Unlimited," a paper before the 5th Annual Conference, Northwest Region, A.I.A., Tacoma, Sept., 1956, argued that America's increasing retreat from things civic, allows the community to take any shape, or misshape, it desires. "Our citizens' eyes are no longer sensitive. They are, in fact, blind."

quires an understanding of the role that existing vehicle taxes play in the process of highway planning. In fact the architects may have a stronger case against the building of some new roads than they themselves realize!

THE GAP BETWEEN SOCIETY'S COSTS AND ROAD USERS' COSTS

Following the close of the 19th century, motorized vehicles began to use the public roads in such numbers that large sums were spent in improving road surfaces for the new method of travel. As the benefits from the improvements appeared to accrue mainly to the motorists, it was inevitable that most industrialized nations started to shift varying proportions of the public's road expenses directly onto the road users by means of fuel taxes and registration fees.

To put it another way, vehicle taxes were introduced to close the *gap* between social and private road costs. But these taxes have *never* been fully successful in closing this gap, and this lack of success undesirably affects highway planners' ability to estimate the need for new roads.

First, the division of road costs between users and non-users:

In addition to road users, part of the road authority's costs are to be allocated to property owners and the general community. (Readers may imagine any division scheme—relative use, predominant use, etc.—it makes no difference to what follows.) Table I gives a hypothetical situation where all the relative tax shares have been apportioned for a town containing three roads. Of the road authority's annual total costs, 47.2 percent would be paid by vehicle owners, 22.2 percent by property owners and 30.5 percent by the general community. Yet actual tax apportionment to (say, the vehicle group) for travel on specific roads should be thirty-three percent, twenty-five percent and sixty-seven percent respectively.

3. Wm. L. Pereira, "Architecture Unlimited," a paper before the 5th Annual Conference, Northwest Region, A.I.A., Tacoma, Sept., 1956. He gives a detailed listing of these problems. See also Elizabeth K. Thompson, in an editorial, "Lost: Vision for City's Unique Opportunity," *Architectural Record*, November 1956, p. (48–1), attacks as short-sighted road planning the decision to build a double-deck freeway in front of San Francisco's ferry building in such a fashion that a projected plaza could not be developed. More recent public criticism can be found in Karl Detzer, "Our Great Big Highway Bungle," *Reader's Digest*, July 1960, p. 45.

TABLE I—AN ILLUSTRATION OF SPECIFIC APPORTIONMENT AND AVERAGE COLLECTION

Road	*Annual Road Authority Cost*	*Vehicle Share*	%	*Property Share*	%	*Community Share*	%
A	1,000	333	33·3	333	33·3	333	33·3
B	2,000	500	25.0	500	25.0	1,000	50.0
C	3,000	2,000	66.7	500	16.7	500	16.7
Total	6,000	2,833		1,333		1,833	
Weighted Average Collection			47.2		22.2		30.5

In short, tax burdens may be *allocated* to a fine degree, road by road, but *collections* will be based on the *weighted average* allocation for *all* roads. This means that even if society in general is able to recoup total road costs, a gap may still remain between various groups and all of society.

When we turn to the division of road user responsibility between various vehicle classes, the same thing occurs in several situations. A third-structure tax system based on the incremental approach may have all the weight apportionments on the basis of data secured from the most up-to-date, superior, rural highways.

The apportionment using this data is then applied to all the heavier vehicles on an average basis, whether or not they ever individually use such high-cost, high-quality roads. To a greater or lesser degree the same thing happens in other third-structure systems such as the ton-mile or operating cost theories.

The really serious cases of the failure to bridge effectively the gap between all of society and various groups of users become most apparent when we look closely at the share of users' costs recovered by motor fuel taxes. From Table I we see that the users' share of the annual cost of road C is $2,000. We will ignore registration fees and third-structure taxes and suppose this amount is all to be recovered from fuel taxes. Suppose, further, that the annual amount is converted to an hourly basis. Then, up to a point, the greater the volume of vehicles per hour using the road, the smaller the share of total cost each vehicle must bear.

At the same time, all the vehicles of a given class using the road will burn about the same quantity of fuel per hour and thus pay a constant rate of tax per vehicle hour even if traffic increases (given

no congestion). There is no direct connection between the road authority's costs per vehicle and the tax revenue collected per vehicle.

If the tax collections per unit-hour are less than the costs per-unit-hour then some of the hourly cost must be recovered from tax collections on other roads where the tax revenue per unit-hour exceeds the cost per unit-hour. This type of cross-subsidization is inherent in all tax schemes where collections are made on an average basis.

In recognizing the existence of this cross-subsidization we are in effect recognizing that the existing tax system has never fully removed the gap in road benefits which persists between users and non-users, between user groups, and between all of society and various sub-groups. Under existing taxes this result obtains even if the total annual tax revenues are great enough to cover the road authority's over-all costs.

THE EFFECT ON HIGHWAY PLANNING

One of the most important practical results of the failure of our present taxing system to close the gap between private road costs and social road costs is that the "existing market" for highway services fails to provide highway planners with a "commercial" investment criterion.[4]

By having public utility managers follow "commercial practices" the investment of scarce resources will take place in the sectors where social needs are the greatest. But in the case of roads, as we have seen, users pay apparent tax costs that may diverge greatly from the road authority's costs for the use of a particular

4. I have deliberately chosen to use the word "commercial" (knowing it may have different meanings to different people) because there are at least two senses in which it may be interpreted for my argument—neither of which changes the argument. We could use the term "commercial principle" to mean that investment is made on the basis of maximizing the future net returns over present costs, which is no more than the usual profit maximizing assumption we credit to any business enterprise. However, where public investment, say in Nationalized industries, is not made on quite the same basis, the "commercial principle" may have a slightly different meaning. It could be interpreted to mean that payments for services should just cover costs and that investment should be carried to the point where discounted future net benefits minus original cost would be equal to zero. For my purposes, a somewhat unprecise meaning of "commercial" is not too critical. All the reasoning will still hold. Either way, we expect the direct beneficiaries to pay the direct cost.

road. This situation creates some very difficult estimating problems. In contrast to many private firms contemplating expansion, the road authority does not work with a set of data based on the experience of individual customers paying the specific costs of specific services.

In fact, the existing "market" for highway services gives very little *direct* information about how badly specific road users want specific new roads. A likely possibility is that if specific users were suddenly faced with the actual road authority costs for some new roads, they might be unwilling to pay them.

In recent years highway planners have been forced to predict the willingness of road users to pay directly the cost of using specific new roads. They have had to judge the demand for new roads strictly on the basis of a commercial criterion. I refer to our recent experience with toll roads, not all of which have been financially successful. As late as 1958 and early 1959 approximately fifty percent of these roads were having difficulty meeting their operating and interest charges out of current earnings. The special charging scheme introduced for each toll road has the effect of establishing two sets of taxing criteria within the same geographical area. One set applies to the free roads already in existence and one set applies to the toll route. The financial difficulties of certain turnpikes in this country clearly indicate that road planners have relied too much on simple estimates of traffic growth.

Not enough attention has been paid to the fact that a lot of traffic may be using existing roads only because the price of travel appears low as long as the existing roads receive tax subsidies. This applies especially to existing freeways. If highway planners have difficulty in estimating the demand for toll roads, the obvious conclusion is that they will have exactly the same difficulty in estimating the demand for any new free road if it must be justified on the basis of a commercial criterion. And unless it is justified on this basis, it may be argued that the building of some new roads will result in a misallocation of public resources.

Despite this, particular new roads *are* being built throughout the nations of the world. Many of these roads (such as the British system of national motorways, extensions to the German Autobahn and the new Interstate system) are of the superhighway type. None of these plans involve toll systems, yet they are all financed mostly by

road users. It is therefore of some interest to examine the process by which the construction costs will be repaid.

All empirical and analytical evidence suggests that in many cases the "average" tax earnings of high-cost super roads would be too low to cover their annual financial costs.[5] Therefore, new, high-cost, "free" road projects must be subsidized by taxes collected from road users outside the area most immediately affected by the projects.

In general, rural roads "earn" less in tax revenues than their annual financial costs (not including existing main trunk roads for which no construction costs have to be recovered). Urban streets tend to earn more than their costs. Glanville and Smeed say: "Thus maintenance expenditure per mile traveled is, as might be expected, higher on the low class roads than on the more important ones."[6]

A 1953 report by the Automotive Safety Foundation on highway transport in Tennessee stated: "It will be noted that state and urban highways with twelve percent of the total state mileage carry seventy-two percent of all travel, while county roads with eighty-two percent of the total road mileage carry fifteen percent of the total traffic. . . . Urban state highways are the most important city arteries. Slightly less than one percent of the mileage, they carry fifteen percent of all travel."[7]

In Utah in 1953, the rural county system tax earnings were $949,748. At the same time the out-of-pocket maintenance expense on these same roads was $2,053,000. Including depreciation as a financial expense, at an average rate of three percent on the original cost of the new construction in these rural areas during the previous seven years, the financial cost for 1953 was $2,251,505. This amount exceeded the 1953 tax earnings on the rural system, by 2.37 times.[8]

5. Imagine the case of an existing toll road, in financial difficulty, after incorporation into the Interstate system. The tax revenue applied to the Interstate system will be approximately 0.3 cents per mile from passenger cars and it is already losing money charging 2.0 cents per mile. But even to maintain the existing rate of collection would necessitate a seven-fold traffic increase.

6. W. H. Glanville and R. J. Smeed, "The Basic Requirements for the Roads of Great Britain," *Conference on the Highway Needs of Great Britain*, Institution of Civil Engineers, London, November 1957, Par. 112, p. 43.

7. Automotive Safety foundation, *Highway Transportation in Tennessee*, Co-operating, Tennessee Department of Highways and Public Works, U.S. Bureau of Public Roads, November 1953, pp. 22–23.

8. *Highway Finance in Utah*, Bureau of Economic and Business Research, U. of Utah, Salt Lake City, 1954, p. 25ff.

It may appear that these examples of cross-subsidization have not revealed any really serious problems. But suppose that to meet the heavy construction costs of a new urban freeway gasoline taxes are raised. The cost of the *local* freeway would then be met by increased *statewide* tax collections.

At the same time, vehicle operating costs on the new freeway would be relatively low, and thus the apparent tax costs would necessarily be relatively low. In fact, the total of these costs would likely appear lower to individual road users than the costs for the use of existing city streets. As a result of these cost differences facing individual motorists, large quantities of traffic would tend to flow onto the new freeway. After a time it might appear as if an additional freeway is needed because of congestion on the original, etc. This, of course, is the very issue that is being raised by architects and other groups especially interested in civic planning.

As I see it, highway planners have one (not too convincing) rejoinder. They may argue that the cross-subsidization of major projects from vehicle taxes collected throughout the state is not something that goes completely unnoticed by the public. The common reaction to this situation is that local groups and their legislators exert pressure on the road authority to arrange new construction in various locations within a state so that none of the local areas "gets left out." It may therefore be argued that cross-subsidization is a two-way proposition.[9]

SUMMARY

It is impossible to determine whether or not a specific road should be built unless more sophisticated techniques are developed to estimate the effective demand for the road. Any use of commercial investment practice requires at least the possibility of being able to match particular costs with particular demand.

Motor vehicle taxes assessed and collected on the basis of the present methods make impossible a direct matching of costs and demand in this fashion. The continued use of existing planning methods means we will continue to build roads where there is a

9. When we stop to consider the rural bias built into the legislative apportionment of most states, we may lose some faith in how equitable a solution this push and pull will be over the long run.

possibility that road users would be unwilling to pay the specific costs.

American highway planners' failure to assess accurately the effective demand for several toll roads is evidence to support the contention that road authorities, basing their demand estimates upon uncorrected data from existing markets for highway services, cannot predict the demand for a specific route.

Under the existing tax system, the cost of any new free road (or the cost of existing roads, for that matter) is met through a continual process of cross-subsidization that enables some road users to have the benefits of high-cost roads at low apparent cost.

It may be that in the long-run we shall work out some different taxing arrangements. The new traffic data resulting from these arrangements would tend to make highway investment planning a function of the usual market mechanism. But for the present, road planners should recognize that their plans may be wrong, not only for esthetic reasons but for economic and ethical reasons as well.

Fleet Safety

CHARLES RAY

Mr. Ray, with Markel Service, Inc. since 1932, became Markel's Director of Safety in 1935 and its vice president in 1950. Previously, from 1903 to 1918, he was employed by C. J. Eitemiller, as clerk and truck driver. From 1918 to 1928, for the Cathedral Cab Company, Baltimore, Maryland, he was the fleet supervisor of trucks. From 1928 to 1931, he was vice president. For eight years, he was editor of Talelites, the company magazine. He is a member and Past President of the Virginia Society of Safety Engineers and of the Pennsylvania State National Fleet Supervisors Committee of the Pennsylvania State University; also a member of the Executive Committee of the Richmond Area Safety Council of the Virginia Highway Users Association, and a member of the Traffic Engineers of Virginia, and of the Safety Supervisors of Virginia. He lives at Boxwood Farm, Ashland, Virginia.

MUCH progress has been made in fleet safety. The possibility of saving life and limb by educating management and drivers for a safe and sane program has been recognized. Also, engineering programs for inspecting vehicles, garages, and property covering terminals and docks have been recognized as important. The keeping of drivers' records to show their driving patterns is valuable. This Markel Service file contains 1,300,000 names. The file shows violations and also the *good* handling of equipment.

Road patrols should not be provided "to get somebody." They should teach drivers the right way to drive—and how to avoid wrong ways. You do not help the accident problem by firing drivers. Most of the trouble is management's inadequate indoctrination of employees. Too few operators are screened; too few receive an exposition of company policies. Often drivers have no chance to meet and talk with the officer to whom they report. Whenever a new fleet is organized, drivers get a book of plans for a minimum safety program.

Yet the driver is most important to the industry: he is a public relations representative, the person-to-person contact between the company, public, and customer. He should be a highly trained operator—and well informed. The minimum safety program encompasses the following:

The Man You Hire: Four steps should be taken to provide the proper manpower of a transportation company—steps to be taken hurriedly, regardless of immediate needs. A first mistake can be the one of selection; and from that error, the results can be multiple and lasting. Therefore the first job is one of job analysis; to understand the requirements to know what sort of man is needed.

No transportation company is any stronger than the men who compose the driver personnel.

The real facts in the case:

First: men must be hired wisely.

Second: they must be trained.

Third: they must be encouraged, stimulated, developed and brought along to feel they belong.

Fourth: they must be properly directed.

The first step is most important . . . Hiring the *right man.* It wastes time and money to train men who have neither capacity nor ability to learn and develop.

For each job there should be a job specification . . . a sizing up of the work to be done . . . type of person . . . age limits . . . education desired . . . type of education . . . experience and other qualifications.

Where and How to Get Men:

1. Walk-ins or from prospect file applicants.
2. Local union agents.
3. Friends of fellow employees.
4. Newspaper advertisements.
5. From other agencies or companies.

Screening the Applicant or Prospect: After setting up the job specifications, and having obtained a prospect, the next step is to interview or screen him; this is where the job meets the man and the determination of whether or not the man gets the job. Throughout this process be fair with the applicant. Listen carefully, observe his personal appearance, posture, attitude, neatness or lack of it, self-confidence or lack of it, the tone of his voice, whether he answers readily. He is to be a customer-relations man. Will customers approve of him?

Carefully find out about his home life, education, friends, his work record, how long he keeps jobs. What former employers think

of him. Has he had too many jobs? Has he mental capacity? Is he an original thinker? Is there enough in him to build on?

To assist with this screening process, use carefully prepared forms. See that they are filled out completely. Handle them promptly. Study them before using so that interviews will not be awkward. Ask for additional information or explanation as may be necessary. Complete the interview by filing a report on the man, with reactions and recommendations.

IT IS TIME WELL SPENT TO GET THE RIGHT MAN

The Safety Program. Safety is selling. Once the employee is properly sold on the safe way to do a job, the problem of control resolves itself into the simple task of keeping him sold. His interest will reflect the attitude and enthusiasm that he sees. If safety becomes secondary, he will disregard it. Therefore the employer can become a generator in his own sphere. The program will not carry itself. It must be kept alive by constant effort and enthusiasm if it is to develop.

The following have been found helpful in employing and developing safe drivers:

1. *Applications:* Application Form—should be complete in every detail.

Standards: Check to see that applicant meets every point.

Procedure: 1. Interview form; 2. Telephone check; 3. Reference check; 4. Market check; 5. Police record; 6. Physical examination; 7. Road or yard test, and 8. Trial run.

Summary: re-check through all forms to be sure that complete report and examination will be pictured in all of the above. To this add interviewers' opinions. This is important.

2. *Minimum Standards for Employment:* In every instance the class and character of men selected should be up-graded. Representatives are being selected for the company. These men will contact the public and the company, and their employer will be judged by how they conduct themselves. Minimum standards are as follows:

1. Age: between 25 and 38 at start. 2. Married men preferred, with family if possible. A man with responsibility is the best worker. 3. Education: at least a high school graduate. 4. Physical: no defects. 5. Appearance: neatness and cleanliness is required. 6. Past em-

ployment: should be a steady worker, not a job-jumper. 7. Previous experience: at least two years on the type of equipment he is making application to drive. 8. Accident Record: a clean record. 9. Driver's License: an up-to-date license and one that shows no violations. 10. No midgets and no giants.

3. *Indoctrination:* This is where one sells the company to the new man. First impressions are often the ones that last the longest. If a new man is properly introduced to the company and trained by a man loyal to the company, it is almost certain that the trainee will become properly impressed and the results favorable. It is that *start* that is important with respect to where the employment will lead.

Start by telling about the industry. It is the second largest industry in the nation today, next to agriculture. Tell new men that the trucking industry has made the biggest single effort in changing the conduct of business, changing the inventory of the nation's manufacturers and storekeepers from a six-month's inventory to a day-at-a-time or week-at-a-time inventory because of over-night and second-morning delivery. Start there, and build a story that will make him proud to work in the industry.

Tell him about the size and scope of "XYZ FREIGHT LINES." Show him where the company fits into the life of all communities it serves and how it started and what its hopes and aims are.

4. *Training and Placement:* The most harmful thing that can be done to a new man would be to select and train him to handle one type of job and then suddenly thrust him into something new and different, untrained and unnerved. This is simply asking him to have an accident.

If the man is to drive a straight truck, and his previous experience and his training have been on a straight truck, then he should be assigned to that type of driving exclusively. Traffic today, especially in the areas where many units operate, will not allow time for a man to gain experience on a strange unit or to look into a manual to find out what he should do in a given situation.

During all the training processes, make sure that there have been carefully selected persons to administer the training and testing. Much good can be developed. If the trainer is sore at the company he will have ample opportunity to steer the man into the wrong

channel, and skill in picking a good employee goes out the window.

5. *Accident Reporting and Investigation:* All accidents should be reported—fully and completely. If the cost of the accidents is to be controlled, each accident must be reported. Promptness is the key.

No accident, however small, can be ignored. They all count, and the one that you may think to be trifling, may prove to be costly. Make sure that the men know how to report accidents. Make sure that they understand *why* they are to be reported. If this phase is understood, co-operation is sure to be obtained. Let the following be standard procedure:

1. The driver is to make a report. This is to be complete in every detail and accompanied by a diagram of what happened.

2. Investigate accident to complete satisfaction, to find what really happened; interrogate the driver.

3. Don't rely on insurance investigator for chargeability of accident. He looks only for liability; look for cause in order to instruct drivers as to how to avoid repetition.

4. Make up a report and submit together with: a. Original of driver's report and diagram. b. Typewritten copy of accident report. c. Report of the accident, investigation details and record of discipline, if any.

6. *Recording of Accidents—Driver Records:* From each accident situation, try to learn something. If nothing else, learn the tendencies of the man involved and what re-training will be necessary to keep him from getting involved again. From the mass production of the entire driver personnel, it will be impossible to keep the individual records separate unless there is a record individually kept. These records must be accurate and complete—yet they must be simple.

Once the records are established, they should be both kept and studied periodically. From this, many things can be learned. The records will serve as the basis of reward, discipline, training and re-training, as well as the means of elimination, if necessary. Records should be reviewed at least every three months. If they indicate accident-frequency, or a tendency toward repetition of certain types of accidents, call the driver in, talk to him about his accidents or tendencies. If a man is going along without accidents, it most certainly behooves management to call him in and congratulate

him for the good effort. This is most necessary since the forgotten man soon stops producing.[1]

7. *Analysis of Accidents and Records:* In a sense, an accident-prone driver or repeater is a sick man. Safety is no accident, and accidents do not just happen—they are caused. Therefore, as the company diagnostician, find out why the men as individuals and as a group have accidents. Not only find out why they have accidents but also work to develop a cure or correction.

Having determined the type of accident, apply the proper set of questions and determine whether the driver is using good judgment. This will enable you to decide on some idea of chargeability. But chargeability is not the final goal. Now devise for stimulating this man to drive without getting caught in the same sort of circumstance again. Again, this is pure selling.

Over and above the single incident or accident report, be alert in watching the driver's record and, when it begins to develop a tendency or frequency, he should be called in for a briefing. Show him where he is heading and what troubles he can be creating for himself and the company.

8. *Handling Accident-Prones and Repeaters:* As previously stated, accident-prones or repeaters are sick men. It may be that the first mistake was in hiring them, or it may be that good judgment was not exercised in handling them after they were trained for the job. In either case, there is a job to be done. If reprimand is necessary, follow these rules:

1. Get all the facts. Be sure to have the whole story. Don't go off half-cocked or jump at conclusions. Keep personalities out of the picture. Fit the facts together. Check company rules and policy.

2. Weigh the evidence. Don't operate on hearsay. Know what you are doing and do not act on an impulse.

3. Decide on a course of action. Be sure the punishment fits the crime or offense. Be fair and firm.

4. In taking action, act promptly. Don't keep the man in suspense.

5. Check results, considering the effects for all.

6. Evaluate results. Look at the whole picture. Has the desired

1. A good maxim to remember is: You will never know your problem until you know your men, and you'll never know your men until you know their individual records.

result been accomplished? Has one been punished to get at the whole group?

Make sure the man penalized understands the why of the punishment. Explain what company rules have been violated and that it is up to him, as all others, to co-operate for the common good of all. Make sure that the rule enforced is a good one.

Most important of all: *never* let a man leave, after being corrected or disciplined, with an unhappy state of mind. Be sure that he fully appreciates why it was necessary to take action against him. An unhappy employee is a discontented employee and the grudge he bears may become a cross for you to carry. If it takes all day to do it, straighten him out and only let him leave when he is in a pleasant frame of mind. Otherwise, he is an accident looking for a place to happen.

OBSERVERS PATROL MILLIONS OF MILES

To get information needed for education, men patrol the highways of the United States and Canada. Last year they covered 5,500,000 miles and made 500,000 visual reports on driver-behavior. Reports are made after the engineer has followed for a minimum of three miles so that he is sure of an even speed, stops at railroad crossings, if carrying explosives or dynamite, or straddling the middle line.

Good driving is recorded as well as bad. Following too close is a habit of great concern. Drivers are stopped and talked to regarding the need for spacing vehicles at least 200 feet apart. It has been found that there is a tendency to move the vehicle to the left about three inches for every ten miles an hour over thirty-five miles per hour. Last year thirty percent of the accidents happened on the middle line. It is hard to sell a driver on the facts concerning a head-on accident. If a vehicle approaches on the wrong side of the road, a driver should pull to the right as far as possible and stop. Nine out of ten times the moving vehicle will pull back on the right side. Had the first vehicle pulled over it would then be on the wrong side. It is much safer to take the crash head-on if stopped. Drivers have been killed by pulling over to the wrong side.

Also, from the files, the third violation is flagged and a copy of the violation is sent to the field engineer. He in turn calls on the

assured and asks for a conference with the driver, and steward of the union if necessary, and they sit down together and discuss the violator's record. Accidents are not caused, but invited, and in most cases this has been verified without a doubt. It could be family trouble, finances, clashing of personalities with other employees of the company, lack of attention to repair requests at the shop—so many different things that only a conference can find the trouble and properly prescribe needed remedies. Showing interest in drivers pays good dividends.

To carry the education a little further, cameras have been installed in the company's patrol cars. They take pictures of the unit showing the speed, time of day, day of month, also such things as speed signs on the highway and hazards that would no doubt be missed by the human eye. These patrol cars can follow the unit into the terminal and show the film within thirty minutes after taking the pictures. Each car is equipped with a developing tank and with a screen so that the pictures taken on the spot can be shown while the facts are still fresh in the minds of the drivers. Moreover, one cannot cheat at this; after these shots are taken, if questions arise, proof can be graphically provided by showing the film on a graph screen.

When the object stays the same size on the graph it shows that a perfect pace has been achieved in observing. This camera can be taken out of the cars and photographs made of dock, terminal, shop and rest rooms. Clean rest rooms are indicative sometimes of the overall efficiency of the operation. These films can be joined together and will make a good safety strip for accident prevention.

Last year, 6,000 surveys were made using the 1958 analysis of that year as a basis. With this the engineer made recommendations to management on how it could save money, time and waste. After the engineer has satisfied himself that he has found the answer, he then prepares a tailor-made program for that operation. He inspects the equipment for defects, such as tires, broken mercury, the front springs from the center bolt to front eye to eliminate the wandering of front wheels on the highway. The constant running into the curb has a tendency to push the axle out of alignment, and this has been the cause of some very bad accidents. Whenever possible, a mirror has been suggested from the wall to ceiling, placed where the driver has to pass it on the way out, with the words,

"This is how you look to other people." One would be surprised at the response from their reaction. Encourage a driver to look neat and it follows that his driving will be better. He will take pride in himself and his job and will be more alert.

WHAT TEN-YEAR RECORDS SHOW

Records of the last ten years reveal that sixty-five percent of the accidents happen the first three and one-half hours after the trip starts. This seemed odd at first. On analysis, it was found that the trouble was at home. In many studies, the fact is borne out that home situations cause many accidents. For that reason the help of wives was enlisted, asking that they become a part of all safety and driver meetings. They were also asked not to argue with the husband just before he went to work. Give him a good breakfast and kiss him goodbye. It works. Where it has been used, the chart shows a downward trend in the frequency of accidents.

Another disturbing fact was that ninety percent of the accidents happen within corporate limits. This can be explained by the fact that trucks were stepping on it in the open spaces and when they got near town they slowed down, but not enough to conform to posted speeds. "Velocitated," they couldn't get down to a lower speed required for the existing conditions.

After the wives were found so helpful, it became the duty of management to remember them. Accordingly, when an operator has driven for four years without an accident, a bracelet is given to his wife as a "Back Home Driver." Nine thousand bracelets were earned last year. Also wives are being selected on a national basis each year, winning prizes. Thirty thousand awards were made last year to drivers, some as high as thirty-six years accident-free. Human relations, whether in the home or in the dispatcher's office is important; a smile takes twelve muscles, a frown sixty-five muscles. One should encourage the smiles and courtesy as they are both contagious. We find that ninety-one percent of the accidents are due to human failures. Accordingly attention must be given to the human driver.

There are so many occasions where the driver does some act of kindness, out of his line of duty, that the company issues a special merit award. This consists of such things as saving the life of a

person who has fallen overboard, or from a fire; and for other merits, drivers may be honored by an award, a diploma, and a dinner in his honor.

In summing this up, one can observe the decline in accidents from one in every 50,000 miles to .72 accidents every 100,000 miles. Indoctrination plays a large part in this result. Also the company has the asset of a driver's file not possible years back to check past experiences and trends. A company should teach drivers what they need to know, make them a part of the organization so they feel that theirs is a "We" company and not an "I" company. Most of all, set a good example.

Transporting the Sick and Injured in Niagara Frontier Plan

HENRY W. OSBORNE

Mr. Osborne is Traffic Advisor and Engineer, Division of Safety, for the City of Buffalo, N.Y. Previously, he had been traffic engineer and advisor in Flint, Michigan and Milwaukee, Wisconsin. Besides his municipal connections, he is consultant to cities in the Niagara Frontier area and to many private and business organizations. He is a member of the Institute of Traffic Engineers, Highway Research Board, Illuminating Engineering Society, the New York State Society of Professional Engineers, past president of the Engineering Society of Buffalo, and president of the Erie County Chapter of Professional Engineers.

A LONG-TIME member of Buffalo's Board of Safety complained of continuous sounding of sirens in the northeasterly business section of the city. His complaint started a worthwhile investigation of transportation of sick and injured persons in the Niagara Frontier.

In the fall of 1958, a special request was received from the National Safety Council to include in the 1958 Annual Inventory of Traffic Safety Activities a section entitled: "Transportation of the Injured." This was the opportunity to study the problem and the questionnaire gave us some guide lines as to how to go about it.

The first thing to consider was who should do this job. The Erie County Medical Association suggested the Western New York Hospital Council. The executive director of the Council was delighted to aid in a survey that started the ball rolling.

The many problems in the overall picture convinced the Buffalo Board of Safety that plenty of help was needed. The Board appointed a special committee on the transportation of the sick and injured, headed by Dr. Wilfred W. Fuge, Governor of the American College of Surgeons (1959-1962) and prominent in Erie County Medical Society activities. Dr. Fuge organized a committee with representatives from sixteen hospitals, seven ambulance service groups and numerous government officials.

For months the committee and its staff searched, researched, wrote letters and studied ways to obtain the best information possible on the subject with this overall objective in mind: "The placing of proper emphasis on the realistic function of an ambulance, the rules and regulations for its control on our already crowded streets, the equipping of the emergency vehicle with sterile supplies and life-sustaining instruments, the training of drivers and attendants in modern and approved techniques; all were major concerns of those charged with total patient care in this mature metropolitan community."

Outstanding guidance was obtained from an article written by George J. Curry, M.D., F.A.C.S., of Flint, Michigan.[1] Dr. Curry's article pointed out that two states, Louisiana (1938) and Massachusetts (1957) had legislation for ambulance control. The following cities had adopted local ordinances: San Francisco; Minneapolis; Syracuse; Cincinnati; Philadelphia; Flint, Michigan; Kansas City, Mo.; Butte, Montana; Pontiac, Michigan and New Orleans. These sources were queried and all co-operated by sending copies of their ordinances with many worthwhile suggestions.

Great credit is given to the joint 1958 action program of the American College of Surgeons, the National Safety Council and the American Association of Surgery of Trauma. This program aimed at preventing accidents and improved care of accident victims. The program included six items:

1. Public education in accident prevention and handling of the injured.
2. Employment of joint and local committees of the American College of Surgeons and National Safety Council, together with other interested surgeons, safety engineers and public officials to formulate safety plans for local committees.
3. Possible registration of unusual cases of injury.
4. Proposed investigations of emergency care of traffic injuries.
5. Model legislation to require adequate training in first aid and transportation of the injured for ambulance attendants, policemen and firemen.
6. Co-operation in the production and improvement of training materials and instructional aids dealing with handling the injured.

1. "The Immediate Care and Transportation of the Injured." Bulletin of the American College of Surgeons, January–February, 1959.

The committee read and studied the many ordinances and selected parts that would apply to Buffalo and the Niagara Frontier. The first draft was assembled and reviewed. Then the second and third. The fourth draft read well and included the desired elements of a good ordinance. This was sent to the city's corporation counsel for his study and further guidance. Finally, the ninth draft was approved by the common council on February 9, 1960 and signed by the mayor. A copy of the final legislation is appended. *See page 536.*

ORDINANCE REQUIREMENTS

In accordance with Section 1859, Article XIX, Chapter XXV, ambulance operators within the City of Buffalo are required to report the use of their flashing lights, sirens or both. The staff of the Safety Division developed this ambulance emergency report form:

AMBULANCE EMERGENCY REPORT

Date..... Time Out.....Time Patient Delivered.....
Removed To .....
Called By .....
Patient's Name .....
Home Address .....
Ambulance Dispatched From .....
Addressed Picked Up .....
Reason For Call .....
Nature of Illness or Injury on Arrival at Scene .....
Siren-Flashing Lights Used Out Yes.....No .....
Siren-Flashing Lights Used Return Yes.....No .....
Remarks.....
Ambulance Firm.....
Ambulance Driver .....

Send report to: Div. of Safety, 1801 City Hall, Buffalo 2, N.Y.
—Chapter XXV City Ordinances Section 1859—

The report form initially required ambulance operators to record "initial diagnosis" and "subsequent diagnosis." There were several objections to these questions from ambulance operators and hospital administrators. The form was revised in May 1960, from "initial diagnosis" to "reason for call" and "subsequent diagnosis" to "nature of illness or injury on arrival at scene." If further objections are made we will soon hear about them. But we want to know the reason for each emergency run.

It is interesting to note that the reporting requirements became

effective April 1, 1960, but most ambulance operators started filing reports weeks ahead.

A summary of emergency ambulance runs is reported for the month of April 1960 as follows: (it is estimated that under the new controls this only represents approximately ten percent of total ambulance runs—all others operate without flashing lights or use of sirens).

SUMMARY OF APRIL 1960
DAILY AMBULANCE EMERGENCY REPORTS

Number of Reports	*Total*	*Percent*
CALLED BY:		
Police	245	56.7
Hospital	65	15.0
Doctor	38	8.8
Public	67	15.5
Rescue Squad	17	4.0
Total	432	100.0
TYPE OF CALL:		
D.O.A.	37	8.6
Auto Accident	105	24.3
Coronary	49	11.3
Mental	6	1.4
Not Noted	178	41.2
Other Accidents	35	8.1
Obstetrics	9	2.1
Medical	13	3.0
Total	432	100.0
LIGHTS-SIRENS		
Out	364	
In	251	
AMBULANCE		
Hospital	211	48.8
Private	221	51.2
Total	432	100.0

Of the 432 ambulance reports, the police called 245 times or 56.7 percent; the next largest number, 67 calls or 15.5 percent was made by the public. Without the 178 causes not noted because of objections to the original question on diagnosis, 105 or 24.3 percent of the ambulance calls were for auto accidents. The next largest group, 49 or 11.3 percent was for coronaries. The records for April 1960 indicate, more than likely, a minimum of sirens and flashing light operations. Three hundred and sixty-four runs out of 432 required lights and sirens, one or both, on the *out* trip, and only 251 for the trip from the scene to the hospital.

We are making progress. The noise of ambulances on our streets has been reduced appreciably. Long before the final enactment of the ordinance, improvement was noticeable, probably because of announcements and reports of numerous hearings and committee meetings.

TRAINING AND COMMUNICATIONS

Another important element of the overall program is training and certification of drivers and attendants. Legislation for controlling the vehicle and its operations on the public way is good, but if the driver or attendant is not properly trained and qualified for handling the sick and injured, the job is not completed.

The ambulance ordinance requires that all ambulance drivers and attendants must satisfactorily complete an approved first-aid course. The Buffalo chapter of the American Red Cross, at the request of the city-county commissioner of health, was asked to conduct a training program. The training includes the following subjects: Common emergencies, special wounds, control of bleeding, use of bandages, treatment of shock, burns, unconsciousness, artificial respiration, poisoning, fractures, and transportation of the injured.

In addition, three other subjects—oxygen therapy, mouth-to-mouth resuscitation, and emergency obstetrics—were taught by physicians. Initially, first-aid instruction was accelerated to meet the effective date of the new law.

Our next big job is to accomplish a consolidated communications system—one for the hospitals and one for all ambulance services, with these two systems interlocked for mutual aid in the event of a national or a natural disaster. It is hoped that these interconnected communications systems can then be used daily to handle the dispatching ambulances to scenes of traffic accidents and other situations requiring such service.

The Western New York Hospital Council has ten hospitals in the city and immediate environs, signed up to work out the details for a two-way radio communications system. This plan is progressing. Eventually, this system will be expanded to cover all hospitals in six Western New York counties. Thirty-four hospitals are involved. We hope Civil Defense will help finance the project. In

addition, directors of other hospital regions are co-ordinating their inter-hospital communications with the program in Western New York. In case of disaster there can be practically instantaneous co-operation with all hospitals.

Dr. Fuge has asked Buffalo's Red Cross chapter to study and present a plan for an ambulance two-way radio system. All other efforts prior to this have failed to produce a workable system. In the meantime, we depend upon the Buffalo police department with its radio and call procedures for dispatching ambulances.

The next task is to bring about some sense in the use of flashing lights. Recently, the New York State Conference of Mayors held a hearing in Albany to develop answers to the problem. The following were asked to participate: Senator Edward Speno; Assemblyman Verner M. Ingram; Superintendent of New York State Police; Volunteer Firemens Association; Power and Light Association; Empire State Ambulance Association; New York Insurance Agents; Bureau of Motor Vehicles; New York State Sheriffs Association; Police Chiefs Association; New York State Conference of Mayors; New York Telephone Company; New York State Ambulance and First Aid Association.

This state-wide group and our committee will in the months ahead search out facts and opinions and develop a program to revise legislation for better protection of the public.

LAWS REGULATING EMERGENCY VEHICLES

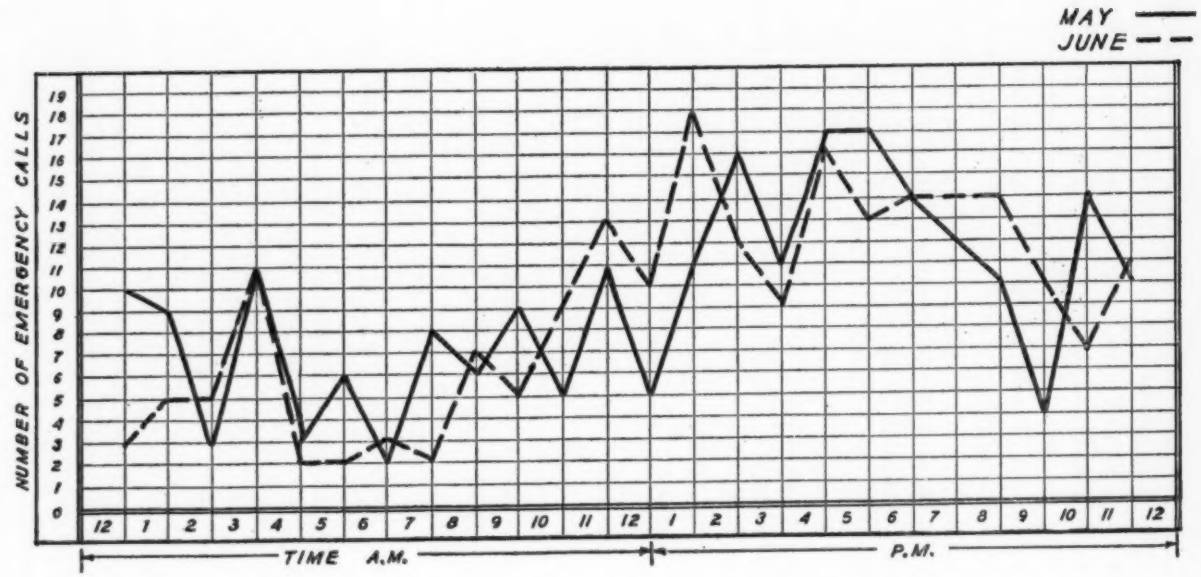
The present New York State vehicle and traffic law reads:

Section 101. Authorized Emergency Vehicle.

Every ambulance and every vehicle operated by a police department, fire department, fire patrol, chief or assistant chief of a fire department, county or deputy county fire co-ordinator, county or assistant county fire marshall, and sheriff, when engaged in the performance of duty as a peace officer or by an authorized public utility company on emergency calls.

Section 1104. Authorized Emergency Vehicles.

a. The driver of an authorized emergency vehicle when responding to an emergency call or when in the pursuit of an actual or suspected violator of the law or when responding to but not upon returning from a fire alarm, may exercise the privileges set forth in this section, but subject to the conditions herein stated.



Emergency Ambulance Calls, totals by hours, May-June 1960.

b. The driver of an authorized emergency vehicle may:

1. Stop, stand, or park irrespective of the provisions of this title;
2. Proceed past a steady red signal, a flashing red signal, or a stop sign, but only after slowing down as may be necessary for safe operations;
3. Exceed the maximum speed limits so long as he does not endanger life or property;
4. Disregard regulations governing directions of movement or turning in specified directions.

c. Except for an authorized emergency vehicle operated as a police vehicle, the exemptions herein granted to an authorized emergency vehicle shall apply only when the driver of any said vehicle while in motion sounds audible signal by bell, siren or exhaust whistle as may be reasonably necessary, and when the vehicle is equipped with at least one lighted lamp displaying a red light visible under normal atmospheric conditions from a distance of five hundred feet to the front of such vehicle.

d. The foregoing provisions shall not relieve the driver of an authorized emergency vehicle from the duty to drive with due regard for the safety of all persons, nor shall such provisions protect the driver from the consequences of his reckless disregard for the safety of others.

SUGGESTED REVISION OF REGULATIONS

A combination of a broad interpretation of this law and, more important, laxity in enforcing the law on the use of vehicle flashing devices, has brought about a situation in which safety officials must act. The following is a summary of opinions and suggestions for improvement:

1. Flashing red is now used on fire and police vehicles, ambulances, on most utility equipment, tow trucks, garage trucks and even on S.P.C.A. trucks. Last year, several doctors asked the New York State legislature to approve the use of flashing red lights on their vehicles.

The use of flashing red is out of hand. It is provoking to discover, after one has pulled to the curb to yield the right of way, that the vehicle is a new garbage truck.

It is planned to have the state law revised to limit flashing red for fire and police vehicles, ambulances, and certain utility vehicles; and no others.

2. Flashing amber lights have been authorized by the State Motor Vehicle Commission to be used by the lead car of a funeral

procession. Recently, a television camera crew was observed driving around town with a flashing amber beacon.

I believe flashing amber is suitable for these and other uses such as utility and tow trucks, including municipal vehicles for garbage collection, snow plowing, and similar devices.

3. Flashing blue should be restricted for the use of volunteer firemen only. The Buffalo fire department has already converted the flashing blue beacons to red in co-operation with the plan.

In conclusion, I would rate our efforts to improve conditions for better transportation of the sick and injured as:

1. *Control of Ambulance as a Vehicle and Its Operation*
   a. Legislation—completed
   b. Inspections—well in hand
   c. Operations—in hand
2. *Training and Certification of Drivers and Attendants*
   a. Legislation—completed
   b. Training program—organized
   c. Acceptance of program—nearly all resistance dissolved
3. *Communications Systems*
   a. For the hospitals—plans progressing
   b. For the ambulances—hopeful
4. *Flashing Lights*
   a. Flashing red—the use out of hand
   b. Flashing amber—hope to require service vehicles to use this color
   c. Blue—for voluntary firemen only

Appendix

C.C.P. 120, 2-9-60

Ordinance Amendment: Article XIX, Sections 1850-1862 Added to Chapter XXV of the City Ordinances: Providing for the Regulation and Control of the Use and Operation of Ambulances for the Transportation of Sick, Injured, or Infirm Persons in the City of Buffalo.

Signed by: Mayor Frank A. Sedita, February 10, 1960.

The Common Council of the City of Buffalo do ordain as follows:

That Chapter XXV of the Ordinances of the City of Buffalo is hereby amended by adding a new article thereto to be known as Article XIX consisting of Sections 1850-1862 and to read as follows:

Article XIX: Ambulance, drivers and attendants:

Section 1850—Definitions and Exemptions.
1851—License required.
1852—Application for license.
1853—Issuance of license.
1854—License of drivers and attendants.
1855—Application for driver's and attendant's license.
1856—Issuance of driver's and attendant's license.
1857—License fees.
1858—Insurance policy.
1859—Obedience to traffic laws.
1860—Duties of drivers and attendants.
1861—Equipment and supplies to be carried and maintained in ambulances.
1862—Penalties.

Section 1850. Definitions and Exemptions:

(1) "Ambulance" is any vehicle equipped for the care of and used in the transportation of the wounded, sick, injured or infirm people.

(2) "Person" is any individual, firm, partnership, association, corporation, company or any organization of any kind.

(3) Exemptions from the provision of this ordinance:

(a) Ambulances owned and exclusively controlled by any federal, state, county or other governmental agency.

(b) Vehicles used in the transportation of the convalescent from hospital to home or from home to outpatient clinics.

(c) Vehicles used in the transportation of the infirm or crippled to and from places for rehabilatory therapy.

(d) A physician, resident intern, and registered nurse.

Section 1851. License required. On and after the first day of April, 1960, no person shall engage in the business of rendering ambulance service upon the streets of the City of Buffalo without first obtaining a license from the director of licenses of the City of Buffalo. Such licensed ambulance shall be operated by a licensed chauffeur who shall be qualified as an ambulance attendant and shall be accompanied by an additional licensed ambulance attendant as hereinafter provided.

Section 1852. Application for licenses. An application for an ambulance license shall be made by the person desiring the same to the director of licenses, on forms provided by him. Such application shall state the place or places from which it is intended or desired to operate such ambulance, giving a description of the premises as well as the location thereof; the place where such ambulance is garaged, and such other information as the director of licenses shall find reasonably necessary. Thereupon an inspection shall be

made by the commissioner of health of each ambulance to determine if it meets the requirements of this ordinance, pertinent state laws, city ordinances and the applicable sanitary codes. If such inspection shows such compliance, the commissioner of health shall approve and countersign the application for a license and forward the same to the director of licenses for the issuance of the license, upon payment of the fee therefor.

Section 1853. Issuance of license. The director of licenses shall issue such licenses upon the payment of the required fee upon such a countersignature by the commissioner of health. Each such license shall expire on December thirty-first of the year for which it is issued. At any time after a license has been issued, the commissioner of health may make, or cause to be made, further inspections, and if any ambulance is found by him to be in violation of this article, the commissioner of health may recommend to the director of licenses that proceedings be instituted to revoke or suspend such license.

Section 1854. License of drivers and attendants. No person shall drive or serve as an attendant of an ambulance licensed hereunder without first procuring a license as hereinafter provided.

Section 1855. Application for driver's and attendant's license. Application for licenses for drivers and attendants shall be made upon forms to be provided by the director of licenses and shall contain such information as the director of licenses shall deem reasonably necessary, in addition to meeting the following requirements and qualifications:

(1) Every applicant for a license to drive shall be the holder of a valid and current chauffeur's license issued by the state of New York.

(2) Each applicant for a license as an attendant shall submit a letter of approval from the commissioner of police, and shall

(a) Submit a current certificate of completion of a first-aid course approved by the commissioner of health.

(3) Upon being satisfied that a driver or attendant meets the requirements of this ordinance, the commissioner of health shall approve and countersign such application.

(a) Provisional approval of such application may be issued for 60 days, if in the discretion of the commissioner of health, additional time is required for completion of a satisfactory first aid course.

Section 1856. Issuance of license for drivers and attendants. After the approval of the application by the commissioner of health and the commissioner of police, the director of licenses shall issue such drivers' and attendants' licenses upon payment of the required license fees. Each such license shall expire on December thirty-first of the year for which it is issued. After such license has been issued, if it is found that the licensee is violating any of the terms of this article, the commissioner of health may recommend to

the director of licenses that proceedings be instituted to revoke or suspend such license.

Section 1857. License fees:

(1) The fee for an ambulance license shall be ten dollars payable annually to the director of licenses in advance. Separate licenses shall be required annually for each ambulance operated and they shall not be transferable except that a license issued for any vehicle belonging to the same licensee shall be transferred to another vehicle upon application therefor, duly verified and showing that the vehicle previously licensed is no longer to be used for the purpose herein contemplated.

(2) The fee for an ambulance driver or attendant, other than a physician or hospital intern, shall be five dollars, payable annually, to the director of licenses in advance.

Section 1858. Insurance policy. All persons who shall operate a licensed ambulance on the streets of the City of Buffalo, shall procure a public liability policy to be issued by an insurance company authorized to do business in the state of New York, to provide liability coverage of at least one hundred thousand dollars ($100,000) for the injury or death of any one person, and three hundred thousand dollars ($300,000) for the injury or death of any number of persons in any one accident, with a coverage of at least ten thousand dollars ($10,000) for property damage in any one accident. Such policy, or a duly certified copy thereof, approved as to form by the corporation counsel and as to sufficiency by the comptroller, shall be delivered to the director of licenses before or at the time of issuance of a license. No ambulance shall be operated within the City of Buffalo, unless such public liability insurance policy continues in good standing. In the event of any material alteration or cancellation of any policy, at least ten (10) days' notice thereof shall be given to the director of licenses, City Hall, Buffalo 2, New York.

Section 1859. Obedience to traffic laws. Every person operating or driving an ambulance in the City of Buffalo shall at all times in the operation of such ambulance comply with all existing provisions of the state vehicle and traffic law regulating the operation and movement of authorized emergency vehicles, as defined in Section 101 and Section 1104 of the vehicle and traffic laws of the state of New York, when responding to an emergency call, and shall be subject to the conditions therein stated.

Each and every time an ambulance responds to an emergency call requiring use of siren and flashing light as defined by Section 1104, paragraph C, the driver must file within twenty-four (24) hours a notification of emergency call with the division of safety, City of Buffalo, on forms supplied by the division of safety.

Section 1860. Duties of drivers and attendants. Ambulance drivers and

attendants shall comply with the request of the patient and/or relatives for removal to a hospital of his choice within a reasonable distance, providing that in their judgment the condition of the patient will withstand extra travel. No person in charge of an ambulance shall refuse to take a wounded, or ill, or infirm, or injured person to a hospital after the need for hospitalization has been determined by a physician, or if made at the request of the police or fire department. When a person is found ill, or wounded, or infirm, or injured in the street or any public place, however seriously, he shall not be left in such location, but shall be removed to a hospital.

Section 1861. Equipment and supplies to be carried and maintained in ambulances:

(1) All sheets, pillow cases and towels used in the care of a patient in any such ambulance shall be replaced with clean sheets, pillow cases and towels after each time such ambulance is used for the transportation of wounded, sick, injured or infirm persons, and all blankets used in such ambulance shall be thoroughly laundered according to procedures established by the commissioner of health.

(2) Oxygen apparatus face masks shall not be used by more than one person and must be destroyed after such use.

(3) After any such ambulance shall have been used for the transportation of any person or persons known to have an infectious disease, such ambulance and its contents shall immediately be cleaned in a manner approved by the commissioner of health, and such ambulance shall not again be used until it has been so cleaned. Each ambulance shall be cleaned with a disinfectant solution daily according to procedures established by the commissioner of health.

(4) All ambulances on the streets of the City of Buffalo shall be permanently equipped with a first aid kit together with sufficient arm, leg and back splints to properly handle and transport emergency cases having such injuries. The first aid kit required shall be prescribed by the commissioner of health.

Section 1862. Penalties. Any person, firm, or corporation violating any of the provisions of this article, upon conviction thereof, may have his license suspended or revoked; shall be punished by a fine of not less than twenty dollars ($20) nor more than two hundred and fifty dollars ($250), or by imprisonment for not more than six (6) months, or by both such fine and imprisonment.

It is hereby certified, pursuant to Section 34 of the Charter, that the immediate passage of the foregoing ordinance is necessary.

Protection Problems at Railroad Grade Crossings

THEODORE M. VANDERSTEMPEL

Mr. Vanderstempel is City Traffic Engineer of Saginaw, Michigan. There he is credited with improving the traffic flow, reducing accidents, laying out a new perimeter route around the high-value downtown business section, and other significant accomplishments. Previously he was City Traffic Engineer for Pontiac, Michigan, and consulting engineer for several other cities. He served also as an engineer in the Bureau of Street Traffic, Chicago, Illinois. In addition to other duties in his Chicago post, Mr. Vanderstempel had charge of improving railroad grade crossings. He also filled the position of Traffic and Transportation Engineer for Miami, Florida, and as Transportation Engineer for the Miami Transit System.

THE most common warning to motorists that they are approaching a railroad right-of-way is the "crossbuck" or X-shaped sign reading "Railroad Crossing." Ways to obtain maximum visibility, essential to their effective use, have concerned railroads for years.

Countless improvements have been made in railroad equipment and allied branches of transportation. Railroad signal and communication systems have improved the safe operaton of fast transcontinental trains. The systems warn enginemen to maintain speed, slow down, or come to a stop.

This guarantees the safety of passengers. With the increase in highway traffic and the necessity for motorists to cross tracks, it became evident that some system of positive advance warning was a prerequisite to safe travel.

At grade crossings in congested areas, railroads have installed bells, flashing lights, and crossbucks, the last mounted on the other signals, and, in some cases, on gates. This protects the highway-user about to negotiate the crossing, and also the railroad equipment, since many collisions with trucks or passenger cars have derailed trains. Yet in many cases little has been done to safeguard grade crossings in the less populated areas or country roads. Except for the installation of crossbucks on either side of the track on the approach side of the highway, and twelve feet removed from the

centerline of the nearest track, no warning to the motoring public exists on secondary roads, particularly at night.

In the majority of cases, these crossbucks are finished with ordinary white paint background and black lettering. Their placement relative to the edge of the pavement or roadway is determined by the location and nature of any visual obstructions. In all cases they should be far enough removed from the edge of the roadway to render early satisfactory notice to passing vehicles.

REFLEX-REFLECTOR MATERIALS

Although the height of the crossbuck has been established at ten feet six inches from its center to ground level, no account appears to have been taken of the fact that the height above the ground of lights on motor vehicles has been lowered and that illumination above the horizontal has been reduced in modern headlamps. Also, the necessity for motorists to switch to lower beams to prevent blinding oncoming drivers—now sometimes done automatically—often results in inability to observe the presence of a crossbuck.

To overcome this obstacle to consistent day and night visibility of the crossbuck, revised manuals of the United States Bureau of Public Roads, as well as most state manuals for highway signs and signals, now encourage the use of reflex-reflective materials on the crossbucks instead of conventional paints. This type of finish will pick up headlamp beams and send them back to the on-coming motorist, thus warning him of the impending grade crossing, a characteristic which is lacking in ordinary paint.

To thoroughly evaluate the characteristics of reflective crossbuck finishes, representative samples were obtained from manufacturers of these materials, including reflective sheeting, beads-on-paint, prismatic reflector button and glass button varieties. These were mounted along roads in the General Motors Proving Ground, the management of which gave its permission to make some of the tests there. Both the fifty degree, seventy-two inch, as well as the ninety degree, forty-eight inch crossbucks were used to assure complete testing of the two designs in common use.

The test crossbucks were installed during the latter part of 1958 and remained on the proving ground until the spring of 1959 and were exposed to all kinds of weather, including heavy snow and

frost. Observations were made during daylight and darkness. At the conclusion of these tests, the crossbucks with finishes that provided the best results were subjected to a rain test to further establish their reliability.

THE COMMITTEE MEMBERSHIP

The membership of the committee judging these signs was composed of railroad maintenance-of-way engineers, communication and signal engineers, division engineers, one public service engineer and two traffic engineers of the Michigan State Highway Department. Due to the fact that the author knew the suppliers of the various materials tested, he did not take part in the judging.

The railroad engineer members of the committee were all members of sub-committee 4, of committee number 9, charged with the improvement of highway grade crossing protection for the American Railway Engineering Association, sponsors of the tests. From these tests two reflective materials proved best and most satisfactory. They were subjected to further tests in a highly industrialized area where smoke and soot would settle and, if adhering or reacting with them, would obscure the effectiveness of the materials and visibility of the signs.

These tests have now been concluded and it is felt that the merits of the two outstanding materials of the six tested should be discussed in additional detail to present data supporting abandonment of painted finishes for crossbucks in favor of reflex-reflective finishes with improved night visibility properties.

BRIGHTNESS VALUES

The one reflex-reflective material which had all the desirable characteristics is enclosed lens reflective sheeting, so identified as to distinguish from exposed lens systems such as exposed lens sheeting or beads-on-paint. During the latest tests the enclosed lens reflective sheeting stood up best and after nine months of severe exposure to the worst weather conditions, saturated with soot, ashes and other deposits, could be cleaned with a damp cloth without detergent. The other finish retained dirt more stubbornly and could not be cleaned without considerable scrubbing of the surface, thereby nullifying its value.

With respect to the optical characteristics of the material used, the following tabulation gives the various brightness values of silver-white enclosed lens wide angle reflective sheeting. It is presented in terms of candlepower per incident foot candle at one-third degree divergence at various angles of incidence.[1]

	Incidence Angle[2]					
	0°	10°	20°	30°	40°	50°
1/3 Divergence[3]	40	40	36	20	12	3

One of the most impressive characteristics of the brightness of enclosed lens, flexible reflective sheeting is the fact that laboratory tests proved that when totally wet, the reflective values were not less than eighty percent of the dry brightness values. These facts were borne out by the rain test given the various materials in the open when a high density rain screen was produced in the field.

The optical and physical characteristics of reflective materials give rise to classifications of reflex-reflective systems as follows:

I. Exposed Lens System

These materials have the optical elements which focus the light exposed on the front surface.

A. Sheeting

B. Beads-on-Paint (Is somewhat similar to the exposed lens system sheeting shown above, but made by sprinkling glass beads on the freshly painted sign surface.)

The performance of this type reflector depends on its ability to retain its designed optical focus. Rain flooding the exposed lens surface alters the focus resulting in a severe reflection loss. The minute crevices in the surface of the material hold dirt causing difficult cleaning problems.

II. Enclosed Lens Optical Systems

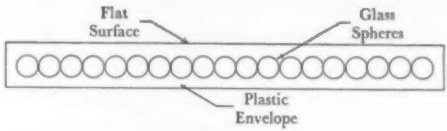
1. AAR Signal Section specification 255–51, Part 276, American Association of Railroads.

2. Incidence Angle—The angle formed by a light beam striking a sign surface and the perpendicular to the sign surface at that same point.

3. Divergence Angle—The angle formed by the light beam striking a sign surface and the reflected beam from the same point.

These materials are designed to be in focus with a smooth outer surface exposed.

A. Sheeting



B. Prismatic Reflector Buttons

Buttons containing cube corner planes moulded within are also enclosed and have been used as automobile reflectors and for signs by insertion in the letter area.

In this system, the optical units are protected by a flat outer surface. The internal optical units are designed to be in focus with a flat surface and the heaviest rain does not alter the focus or appreciably change its efficiency. Because a flat surface is employed, dirt does not readily collect and cleaning is simple.

To illustrate the reflective characteristics of the most desirable crossbuck material, a comparison with other general kinds of sign finishes is revealing and shows why enclosed lens reflective sheeting is a far superior finish for crossbucks.

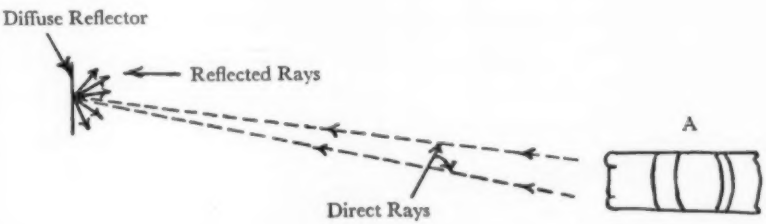


Figure 1

Diffuse Reflectors: The type of finish often used is of the diffuse type. Dark objects, such as roads, runways, trees and stones absorb most of the light striking them. Light objects, such as white painted signs, reflect nearly all the light striking them but in so doing scatter it over a wide area so that little light is reflected in any one direction. The scattered or diffusely reflected light is of little use to the driver of car A shown in Figure 1.

The Metallic or Mirror Reflector: The metallic reflector, instead of scattering the light as shown in Figure 1, reflects it only in one direction and this is never back toward the driver in car B unless the mirror is focused exactly right. Therefore, this type of reflector is also of little or no use to the driver in car B in Figure 2.

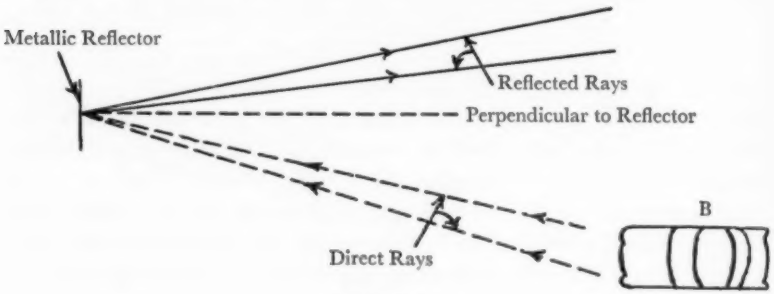


Figure 2

Reflex-Reflective Sheeting: This material is similar to the metallic reflector in that it reflects nearly all the light in one direction. However, it is a useful reflector for signs, because it has the distinct advantage of reflecting the light back to its source, which happens to be the driver in car C in Figure 3. The light is not scattered as in Figure 1 but is returned toward the source in a narrow cone.

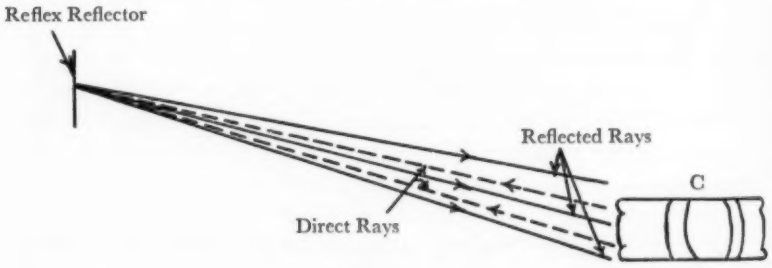


Figure 3

This type of reflector occurs in nature only in the eyes of some nocturnal animals, a phenomenon motorists have witnessed many times. The reflective sheeting reflects light in this fashion with the result that it appears 125 times brighter than the best white paint,

described in Figure 1, when observed under the same conditions of illumination. To describe how well a certain reflex-reflector works, several factors should be taken into consideration.

Brightness: Is the term which describes the amount of light, per unit area, returning from a reflex-reflector. This brightness can be expressed as:

a. *Directional Reflectance:* The number of times brighter a given reflector appears than a perfect white surface of the same size and shape when viewed under the same conditions of illumination. A perfect white surface is both perfectly reflecting and perfectly diffusing and is approximated by a good flat white paint.

b. *Candlepower Brightness:* The candlepower reflected per incident foot candle for each square foot of sample. The candlepower from the sample is measured at the receiver. The foot candles from the light source are measured at the sample and perpendicular to the light beam. This measurement system is used by the Society of Automotive Engineers for the measurement of the efficiency of reflex-reflectors. The figures given in the preceding table are derived by this method.

c. As percentage of light reflected compared to a specified standard reflector as one hundred percent.

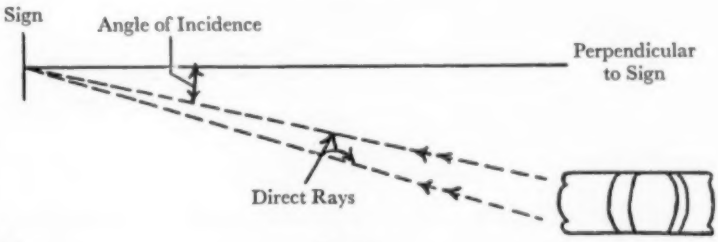


Figure 4

Angle of Incidence: When a reflector is so located that the direct light rays from the light source strike it at other than the perpendicular, the angle between the direct rays and the perpendicular to the face of the sign is called the angle of incidence. See Figure 4.

Angle of Divergence: The angle between the path of the direct light rays and the path of the light rays reflected to the observer in the car in Figure 5 is called the angle of divergence. This definition

should be mentioned here because for all practical conditions the observer is never directly behind the light source, the lights of the automobile. For subsequent discussion it is desirable to express this factor as an angle rather than a distance.

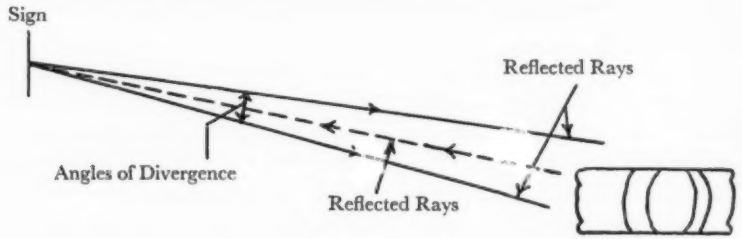


Figure 5

To further explain the relation of the position of the driver and the sign, the distance between the two changing constantly, Figure 6 is presented.

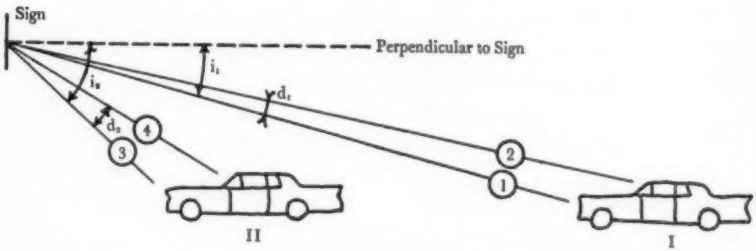


Figure 6

When the car is in position I the incident rays from the headlights (1) strike the sign (crossbuck) and are reflected back along path (2) to the driver's eyes. The angle between rays (1) and (2) is the divergence angle (d_1) for this position. The angle between the incident ray (1) and the perpendicular to the sign is the incident angle (i_1).

When the car is in position II, closer to the sign, it will be noted that the angle of divergence (d_2) between the incident ray (3) and the reflected ray (4) is greater than (d_1) and also that the angle of incidence (i_2) between the incident ray (3) and the perpendicular to the sign is greater than (i_1).

Since the distance between the driver's eyes and the car's headlights is constant, the closer he gets to the sign the greater will be the angle of divergence. For the driver of the average passenger automobile the angle of divergence at a distance of 600 feet from a sign is 0.3°, at 300 feet it is 0.5°, at 100 feet it is 1.7° and at 50 feet it is 2.5°.

It is evident that for good visibility at night it is essential that the reflected light rays from the headlights of an automobile be directed back to the source in a narrow cone to the driver's eyes. In the most satisfactory reflective systems, the divergence cone is designed to be most intense at narrow divergence angles and the total divergence angle is limited to approximately three degrees.

This characteristic cannot be obtained with conventional paints applied to crossbucks. The reflective sheeting made by well-known manufacturers incorporates the above characteristics. Specification of such material in sign standards should prevent many railroad grade crossing accidents caused by insufficient visibility or warning to the motorist.

Mechanized Hitching-Post, 1960

JOHN R. KERSTETTER

Mr. Kerstetter has been Director of Research for the American Municipal Association since 1951. His career has been devoted to the professional study of municipal affairs. He has had staff experience with independent governmental research organizations in St. Louis, Denver, and Newark, and in Denver served also as an administrative assistant in the mayor's office and as administrative consultant to a major department of Colorado's state government. He has also had local governmental experience with chambers of commerce, having been on the staff of the United States Chamber of Commerce as a consultant in local governmental research, and with the Dayton, Ohio, Chamber of Commerce as Manager of its Governmental Affairs Department.

TOURISTS, accustomed to promotional civic signs at the outskirts of nearly every town, are assured in Oklahoma that Tonkawa is a city that "has everything—*except parking meters!*"

However pleasing may be the prospect of saving nickels, the cost to Tonkawa can be estimated at $7,400 a year on the basis of on-street meter revenues in cities of its population class.

Throughout the nation, the most careful estimates indicate that in their silver anniversary year no less than 1,950,000 parking meters were collecting about $127,350,000 annually for 3,850 municipalities. The figures include on-street and off-street meters operated by the municipality or by a municipal authority or other agency, installations in a few urban counties but not those in county governments generally, or meters operated by state governments at educational or other institutions, in trade or recreational areas, or elsewhere. No federal installations are included in the estimates, nor are meters in off-street facilities operated by private or quasi-public bodies. The term "meters" does not include parking "gates" or other such devices for handling more than a single parking vehicle. In this connection, so-called "double" meters are reported in terms of *spaces*; i.e., each "double" meter counts as two.

FIRST COMPREHENSIVE REPORT

The current American Municipal Association survey is the first of a comprehensive nature since AMA, with the Highway Research

Board, reported on "Parking Meters—Their Number, Revenue and Use" from 1951 data. A complete report of the study, in six or more months, is expected. Meanwhile, we present these highlights of the results, based upon replies from 1,565 cities through June 30 from municipalities of every size in fifty states, the District of Columbia, and Puerto Rico. These have been allocated to ten population groups[1] in seven geographic regions[2] for purposes of analysis. Some 1,200 are comprehensive replies to a detailed questionnaire; the remainder are responses to an abbreviated version subsequently circulated.

These municipalities, occasionally referred to hereafter as "the whole group" or in similar terms, include cities with as few as twenty-one on-street meters (Jasper, Florida) and as few as five off-street meters (Escanaba, Michigan) ranging upward to the combined total of 53,739 in the City of New York. On-street meters, usually referred to hereafter as "at-curb" meters, number 1,007,322 in 1,554 of these cities. Their annual revenue, for the 907,348 meters in 1,288 cities separately reporting this data, aggregates $67,201,040, an average yield of $74.07 a meter.

611 CITIES WITH 164,286 METERS

Within the whole group are 611 cities with 164,286 meters at off-street municipal parking facilities. Revenue separately reported by 358 of these cities with 129,694 off-street meters comes to $8,542,650 annually, averaging $65.88 an off-street meter. To complete the picture, 171 report revenue from their 99,974 at-curb and 34,592 off-street meters, another $8,507,780 for a combined average yield of $63.22 a meter.

1. POPULATION GROUPS are as follows: I—Over 1,000,000; II—500,000–1,000,000; III—250,000–500,000; IV—100,000–250,000; V—50,000–100,000; VI—25,000–50,000; VII—10,000–25,000; VIII—5,000–10,000; IX–2,500—5,000; X—Under 2,500.

2. REGIONS are as follows: *New England*—Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont; *North Atlantic*—Delaware, Maryland, New Jersey, New York, Pennsylvania, Virginia (plus District of Columbia); *North Central*—Illinois, Indiana, Kentucky, Michigan, Ohio, West Virginia, Wisconsin; *Southeast*—Alabama, Florida, Georgia, Mississippi, North Carolina, South Carolina, Tennessee, (plus Puerto Rico); *Southwest*—Arizona, Arkansas, Colorado, Kansas, Louisiana, New Mexico, Oklahoma, Texas; *Central West*—Iowa, Minnesota, Missouri, Montana, Nebraska, North Dakota, South Dakota, Wyoming; *Far West*—Alaska, California, Hawaii, Idaho, Nevada, Oregon, Utah, Washington.

Average revenues per meter, computed for each population group in each region, show these variations in per-meter revenue yield:

Cities reporting: (*National average*)	*Region and Population Group*	*Revenue, year; Average per meter*	*Number of Cities*	*Number of Meters*
At-Curb separately ($74.07)				
Highest	North Atlantic, Gr. II	$126.55	2	65,097
Lowest	Southeast, Gr. VIII	15.73	40	36,501
Off-Street separately ($65.88)				
Highest	Central West, Gr. II	279.35	1	673
Lowest	North Central, Gr. X	5.15	1	97
Both jointly ($63.22)				
Highest	Southwest, Gr. VIII	129.23	1	325
Lowest	New England, Gr. X	22.32	1	224

Selected as a basis for detailed analysis is a group of 1,000 cities reporting earliest in the survey with responses requiring no undue re-inquiry. These cities are collectively referred to as "the thousand" or the "survey group." The term "cities" is used in its generic sense, including also towns, villages, boroughs and a few municipal townships. The survey group includes four urban counties: Arlington Co., Va.; Howard Co., Md.; Los Angeles Co., Calif., and Hawaii Co., Hawaii that operates the meters at Hilo. Combined city-county governments are of course included, among them Baltimore, Boston, Honolulu, New Orleans, Philadelphia, and San Francisco.

The thousand cities include 990 operating 621,806 at-curb meters and 375 cities operating 90,897 off-street meters.

The survey group—replies received in February and March—includes Chicago, Cincinnati, Cleveland, Detroit, Los Angeles and Pittsburgh. Later-arriving replies from New York, Houston, Milwaukee, St. Louis, and San Juan are not included in the survey group, though reference is occasionally made to certain data from them. Altogether, replies were received from virtually all cities of over 100,000 population. Nearly thirty percent of the replies came from cities below 5,000 population.

One-third of the thousand cities are in population Groups VI and VII, between 10,000 and 50,000 population. The North Central region embraces a quarter of the reporting cities, the North Atlantic group, next largest. The largest individual group is that embracing North Central cities between 5,000 and 10,000 population. All of

these situations prevail also in the whole group from which the thousand were selected. States with from sixty-five to seventy cities in the thousand are California, Michigan, and Pennsylvania. Every state is represented in the survey group.

SURVEY ELEMENTS

In the survey are forty-three cities that installed their first at-curb meters prior to 1940. In those years of both original and most recent at-curb installations, single-shot installations are apparent in eighty-five cities where the two are the same, seventy-three of these were in 1955 or earlier, with twenty-eight prior to 1950.

All but three of these coincident dates of first and last installations (excluding replacements) are in cities of under 25,000, the majority having less than 5,000 population. Seventeen of the single-shot cities are situated in Wisconsin, one dating from 1947 and twelve from 1950–1953. The year of most recent installation is the same as for the original in the case of off-street meters in fifty-eight reporting cities, with post-1955 dates predominating.

Comparison with the 1951 study indicates that the last decade showed continuing growth in extent and intensity of parking-meter use. The current survey group includes three Alaskan cities, as against one appended to the 1951 report, and two jurisdictions in Hawaii, both of which made their first installations in 1952.

INCREASED AWARENESS OF METER REVENUE

Baltimore, largest bastion of the uncluttered curb, succumbed in 1956. Parking meters are still illegal for on-street use in North Dakota, but the state's attorney general has ruled that the devices may be used on municipal parking lots operated for revenue, and two cities within the survey group use them. Expansion in the use of off-street meters is reflected in the fact that 238 cities, among the 309 reporting installation dates, put in their first off-street meters after 1951. Of those, 139 came since 1955.

Increased awareness of meter revenue appears in these sketchy comparisons: Since revenue data for only a few cities appeared individually in the 1951 report, only a few in each group can be compared with current yields. Each group is made up of geographically separated cities. No group contains more than one city from any particular state.

Population Group	*No. of Cities*	*Meter Revenue* 1951	1959
10,000–50,000	5	$ 420,642	$ 652,232
50,000–100,000	5	683,377	876,156
100,000–500,000	8	1,982,760	2,777,202
Over 500,000	6	2,666,582	4,237,177
Total, over 10,000	24	$ 5,753,361	$ 8,542,767

Such increases in revenue may of course be due to a composite of various factors, including more numerous meters, increased rates, increased patronage, extended hours of operation and general growth in city size and economic activity.

'AT-CURB' RATES

As shown in Table I, curbside parking at the conventional rate of a nickel an hour is predominant in the "thousand" cities taken altogether. In 871, a penny buys twelve minutes parking at 357,415 meters. An hour for a nickel is obtainable at 440,873 meters in 945 cities; a second nickel gives a second hour at 196,376 meters of 641 cities. These figures, of course, count the same meters (and cities) more than once according to the choices they offer. The growing ten-cents-an-hour rate is effective in 100 cities at 78,561 meters, a nickel buys a half-hour at 80,279 meters in 145 cities.

In both cases over three-fourths of the meters, but less than half the cities, are in the population groups above 50,000, with about half the meters in cities over 500,000 population. Some 42,000 meters provide two hours of parking for a nickel in 158 cities, of which half are of 25,000 or less population, though having only thirty percent of the two-hours-for-five-cents meters. About half the 42,000 meters couple the two-hours-for-five-cent rates with twenty-four minutes for a penny in 111 cities, and with four hours for ten cents in sixty-eight cities.

HOW MUCH PARKING A NICKEL BUYS

Worth of a Nickel. Among 989 reporting cities the largest single group of meters in each operate "at the rate of" an hour for a nickel in 882; at thirty minutes for a nickel in forty-six; at two hours for a nickel in thirty-seven, and at other rates in twenty-four cities. The largest group of meters may be universal or clearly predominant

in some cities; in others it may number only a few more than the group of meters at a different rate. Half the forty-six cities with thirty minutes the predominant "worth of a nickel" are above 50,000 population, with half of those above 250,000. Conversely, half those with two hours the predominant worth are of 10,000 or less population. The North Atlantic and Far West regions carry disproportionate weight toward the thirty-minute, and the Central West toward the two-hour, worth of a nickel. All but two of the forty-nine New England cities reporting appear in the one-hour worth category as do, of course, the vast majority of cities in all the other regions. Cities of more than 500,000 in the whole group of more than 1,500 cities divide according to the worth of a nickel at their curbs, clearly predominant in all cases, as follows:

Two hours —Philadelphia.

One hour —Boston, Chicago, Cincinnati, Detroit, Los Angeles, Memphis, Milwaukee, New Orleans and St. Louis.

Half-an-hour—Atlanta, Baltimore, Cleveland, Dallas, Houston, Kansas City, Minneapolis, New York, Pittsburgh, San Antonio, San Francisco, Seattle and Washington.

METROPOLITAN AREAS SURVEYED

Metropolitan pattern. Within the survey group forty-four standard metropolitan areas were represented by more than a single city, twenty by two, and twenty-four by from three to twenty-two cities. Among the twenty the predominant rate of both the cities was the same in seventeen cases, in two cases the suburb allowed less and in one case more parking time for a nickel at its predominant group of meters than did the central city. Among the twenty-four metropolitan areas for which more than a pair of cities could be compared, all in the area predominantly allow one hour a nickel in nine cases, while in three, the central city and most suburbs use the hour-nickel rate, while a few suburbs allow more time. In ten cases, the central city only predominantly allows thirty minutes a nickel with all reporting suburbs more generous; the other two found the predominant central city rate higher than some suburbs but lower than others.

Disappearing Parking Nickel? As a rough means of measuring the trend in at-curb meter rate schedules during the last nine years, figures for 1951 from the AMA–HRB study were compared to 1960

figures for the current survey group. On an admittedly over-simplified basis, the largest total in the thirty-minutes-for-five-cents schedule, and the largest in the one-hour-for-five-cents and-two-hours-for-five-cents schedules, were added together, separately for 1951 and for 1960, each total being taken as one hundred percent for the particular year. From this comparison the relative status of the two-hours-for-five-cents-meter seems static, being 7.1 percent of the total in 1951 and 7.5 percent in 1960.

The nickel-an-hour meter has definitely slipped—from 91.1 percent to 78.3 percent, while the dime-an-hour variety gained from 1.8 percent to 14.2 percent dramatically. When New York City meters are included with the 1960 survey group, as they were in 1951, the shift is intensified—to bring the dime-an-hour meters to twenty-one percent of the total and further drop the nickel-an-hour variety to seventy-two percent, with the two-hours-for-five-cents group still clinging to a seven percent position.

OFF-STREET RATES

The nickel still buys an hour's parking at more off-street meters, overall, than any other quantity. Table II shows 42,952 meters in 240 cities reported on that rate as against 20,832 in 155 at two hours for five cents and 7,796 in thirty-seven at thirty minutes for five cents, the most numerous in the second and third most popular bracket schedules.

The predominant off-street schedules are one hour for five cents in 198 of 374 reporting cities, ninety minutes a nickel in ten, two hours in 109 and over two hours in twenty-one. Less time than an hour is given for a nickel by the predominant group of off-street meters in about a tenth—thirty-six—of the cities, the allotment being exactly thirty minutes in twenty-four, even less in five, and somewhat more in seven. Half the cities with off-street meters predominantly giving over two hours a nickel are between 5,000 and 20,000; half those allowing less than one hour are between 25,000 and 100,000, while more than a quarter—ten—are in the over-100,000 groups.

Nickel Also Slipping. At the nation's parking lot meters the nickel rate is also disappearing. For the smaller number of off-street meters a somewhat more comprehensive comparison of 1960 rates to those of 1951 is possible. Compared are the maximum number of meters

at any particular rate within various bracket schedules when these amount to 1,500 or more meters in 1960 data. Off-street meters providing exactly one hour for a nickel were 52.8 percent of the overall total in 1951, only 46.0 percent in 1960; those giving more time dropped from 46.6 percent to 35.1 percent to allow for a burgeoning 18.9 percent allowing less than an hour as against 0.6 percent in 1951. Figures as well as percentages may be of interest. Among the 16,661 of 1951, there were only ninety-six at less than an hour—thirty-six minutes—for a nickel; today among 93,311 there are 17,565 ranging from 36 minutes down to 20 minutes per nickel.

Among reporting cities over 500,000 population 100 percent of the 398 reported meters were giving exactly one hour for a nickel; in 1960 only 18.3 percent of the 8,389; 15.1 percent give more than an hour, but 66.6 percent give *less* than an hour for a nickel. Among cities between 100,000 and 500,000, forty-five percent of reported off-street meters give less than an hour for a nickel, but these drop to ten to fifteen percent in the groups down to 25,000, to four to five percent for those down to 5,000. This smallest group of cities has 42.5 percent of its meters set to deliver more than an hour of off-street parking time, proportions slightly below the near-fifty percent for cities of 5,000 to 25,000, above the thirty-seven-to-forty percent for the 25,000–100,000 groups and far above the eight percent in those of 100,000 to 500,000 population.

Metropolitan Rate Practice. Measuring by the largest group of meters at a particular predominant rate in each city, almost all suburbs are more generous than central cities in time allowance. Among thirteen metropolitan areas for which comparisons of off-street rates can be made this is universally the case in eight, although data for only one or two suburbs is at hand for half of these. The four with more suburbs represented in the data are New York, Chicago, Detroit and St. Louis. In three metropolitan areas—Boston, Los Angeles and Washington—reported suburban off-street rates are the same as those of the central city in most cases but lower in a few. Two reporting suburbs have higher off-street rates than their central city, West Palm Beach. Minneapolis and one reporting suburb use the same nickel-an-hour rate while the co-center, St. Paul, reports no municipal off-street meters.

Information was volunteered by six cities—five under 10,000

population—on arrangements involving stickers enabling a motorist to park at a meter without depositing a coin therein. The three smallest, all below 5,000, have only at-curb meters; costs are $3.50 a month at Barnesville, Ga., $4 at Fayetteville, W. Va. and $5 for a two-month permit at McKee, Ky. The largest of the cities, Harrison, N.Y., has only off-street meters and issues annual permits at $6 for residents and $24 for non-residents. In the 5,000 to 10,000 population groups, Ennis, Tex. receives $3,900 revenue a year from $4 monthly stickers enabling parking at any meter for any length of time. while Mt. Kisco, N.Y. sells commuters a $9.75 quarterly sticker good either on unmetered lots or at any of its 257 off-street or 19 at-curb 10-hour meters but none others.

INCREASES MADE AND CONTEMPLATED

Relatively recent curb-rate increases have been reported by seventy-six cities, and by twenty for off-street meters. These are increases effected since 1955; the years 1958 and 1959 have seen the greatest number of increases in both categories, but one off-street increase, and six at-curb, have been reported during early 1960.

Cities with increased at-curb rates are distributed in general relation to the total number of cities throughout all the geographic regions except New England, where only one city, in the 10,000 to 25,000 range, has reported an increase since 1950. In off-street rates, no increases in the past eight years have been reported by any New England or Southwest city and by only a single municipality, in the 5,000 to 10,000 range, in the Southeast region. Among the seventy-six cities reporting post-1955 increases, fourteen are above 250,000 population, illustrating a greater readiness to adopt increases by cities of commanding size.

Considering Rate Increases. Among the 990 cities operating at-curb meters, forty-four indicate that rate increases are, or were at the time, under consideration. Only 433 stated that rate increases are *not* under consideration for their at-curb meters. The possibility of near-future increases in off-street rates was noted by eleven cities among the 375 having such installations; since 164 assert that they were *not* presently considering increases the 200 remaining also have unreported intentions as to increasing off-street rates. Ten

of the eleven cities considering increases are between 10,000 and 100,000 population, the other being smaller; nine are in the three northeastern regions, the other two in the Southwest.

While none of the cities above 100,000 in population reported considering off-street increases there were ten of that size among the forty-four planning increases in at-curb rates, three apparently on the heels of increases effected during 1959 or thus far in 1960. These may involve different meters, however, since in larger cities increases are often selective, applicable initially to meters located in busiest sections and subsequently extended to others more remote. In smaller cities rate increases typically involve all meters along the streets, in off-street locations, or both.

METERS ABANDONED

In the course of the survey we have had confirmed reports of complete abandonments of parking meters by at least 48 cities, which are thus excluded from the whole group of cities heretofore referred to. These voluntary abandonments do not include cities in North Dakota, all of which had their on-street meters declared illegal by state action. The forty-eight abandonments include two cities between 25,000 and 50,000 population, 19 between 5,000 and 25,000, and 27 of 5,000 or less population.

In at least six cases, both at-curb and off-street meters were abandoned; in the others only at-curb meters had ever been installed. The total of meters abandoned was 7,763 for thirty-four of the cities reporting. Exactly half these cities, seventeen, did not dispose of the meters but were holding their 4,738 in storage, though only two indicated that re-installation was being considered currently. In the case of the two largest cities, and one other, the competition of outlying shopping centers was specifically mentioned. Opposition by merchants was cited in ten other cases, and general dissatisfaction by fifteen cities, all below 10,000 population. Meters were reported to have been "unprofitable" in six cases, sundry reasons were assigned by another six cities and the cause was unreported in nine cases.

Partial Abandonments. In addition to the foregoing, at least ten cities, within our whole group, have completely abandoned their off-street meters while retaining those along the streets. These

abandonments, which removed some 750 meters, occurred in 1959 in seventy percent of the cases.

REMOVAL OF METERS

Removal of meters in significant numbers, during a single quite recent year, were reported by 139 cities as to at-curb meters, and by twenty as to off-street, beyond the nine completely abandoning this type. Removals of less than ten meters were disregarded in all cases, as were removals which were actually replacements of meters. Urban renewal clearance of land was the cause for removal of at-curb meters in thirty-six of the cities, and of off-street in four cases.

Instances of the former are to be found in all population groups, including the smallest. Increasing the per-car space allowance was cited by twenty-four cities with at-curb removals, three with off-street. At-curb removals exceeded 300 each in eight cities and were 100 or more in thirteen others. Sizeable removals were noteable in the Southeast, with Chattanooga reporting 1959 removals of 300 net over new plans and two South Carolina cities 379 net. Off-street removals exceeded 300 in four cases, and 100 in nine more. Parking gates displaced 1,153 meters on off-street lots in Detroit, Sioux Falls and New Rochelle, N.Y.

Plans for new meter installations are reported by 78 cities planning for new at-curb meters, twenty-five for new off-street, and twenty-nine for both. Envisioned, almost universally for 1960 installation, are 14,903 new meters along the streets, and 10,319 in off-street facilities. In contrast 133 cities affirmatively state that they plan *no* new at-curb meters, forty-three so state as to off-street. The North Central and Far West regions have the most ambitious plans, the former for 7,334 new meters in 34 cities, the latter for 7,565 in 28 cities.

PURCHASE OF METERS

While 576 cities reported price and quantity data on their most recent purchase of parking meters, only about 200 were selected for comparison of prices paid on new single-car multi-coin meters when purchases were made since January 1, 1958 and in quantities of not less than ten meters. On the basis of ninety-six transactions in-

volving 24,815 meters, prices ranged from $20 to $68 on automatic meters; in 95 purchases of 13,272 the range was $30 to $70 for manual meters.

Regional variations are apparent in the following tabulation, in which the median price is at mid-point of the number of meters purchased, not of the cities purchasing. In the four cases where the median is the same as the low price, a preponderance of one city's purchases bulks large enough to contain the mid-point for the whole group; e.g., San Francisco's purchase of 12,862 among the 16,883 of the entire Far West region. The tabulation also suggests the relative tempo of meter buying in the various regions, even though meters for replacement, as well as for new installations, are included.

	Manual					*Automatic*				
	Transactions		*Prices*			*Transactions*		*Prices*		
	Cities	*Meters*	*Low*	*Median*	*High*	*Cities*	*Meters*	*Low*	*Median*	*High*
New England	2	95	$51	$51	$65	3	389	$44	$44	$60
North Atlantic	16	1,209	49	60	68	15	1,883	47	57	65
North Central	23	2,652	37	55	68	31	5,464	30	48	65
Southeast	12	1,797	40	47	61	7	1,548	45	45	60
Southwest	10	1,389	36	60	66	11	970	40	54	65
Central West	10	790	47	55	60	13	1,637	40	50	60
Far West	23	16,883	20	20	60	15	1,381	39	51	70

Same Brand? Of 829 cities indicating whether or not all their meters are of the same brand, 581 answered in the affirmative. Of these, at least 127 have the same brand for both their curb-at and off-street meters. Among cities with both, 22 have a single brand for at-curb meters, a different single brand for off-street. Among cities with only at-curb meters two different brands are reported by 62; altogether 127 report using two brands of at-curb meters, 29 three brands. Off-street meters are of two different brands in 37 cities and of three in only two reporting. Greatest diversity is shown by one city of over 1,000,000 population which reports four brands of at-curb, and four of off-street meters.

LOCATION AND TYPE

It may be assumed that cities with at-curb parking meters locate them wholly in commercial areas of the 990 such cities, 954 do report that ninety-seven percent of their meters are, on the average,

so located. However, 131 cities report that some meters are in residential areas, thirteen percent of their meters on the average. Industrial areas are given as a site of at-curb meters in 67 cities. The North Atlantic and North Central regions account for over half the cities in both cases.

Off-street meters are predominantly located in downtown municipal parking lots; 314 of the 375 cities so locate ninety-six percent of their meters. Outlying lots are mentioned by 31 cities and garages and ramps by only 8, but each group has an average of half its meters so located.

Double vs. Single. Customarily a single parking meter controls one parking space for a single car. So-called "double" meters may enclose two mechanisms in a single casing; the terminology sometimes includes two separate meters mounted on a single post. In terms of parking *spaces* (two per double meter) usage as reported by cities shows double meters noticeably more favored for off-street use than for at-curb installations, but in a definite minority in both categories.

	"Double"	*"Single"*	*Not Reported*
	%	%	%
At-curb meters	3.5	85.0	11.5
Off-street meters	19.8	65.8	14.4

Automatic and Multi-coin. Less disparity appears as between at-curb and off-street usage so far as choices between manual or automatic meters are concerned, and as between those accepting only a single denomination of coin or two or more denominations. For both uses the survey replies indicate a slight edge in favor of automatic meters and a decided preference for multi-coin meters. The practice in relation to number of meters (again, two *spaces* where "double" meters are involved) has been reported virtually 100 percent, as follows:

	Operation		*Coin Denominations*	
	Manual	*Automatic*	*Single-coin*	*Multi-coin*
	%	%	%	%
At-curb meters	43.2	55.2	23.5	76.5
Off-street meters	35.4	61.9	18.0	82.0

Coin Combinations. The penny-nickel meter is still predominant among the streets, being found in 595 of the 990 cities with at-curb

meters. Almost as numerous are the 441 cities using penny-nickel-dime meters. (Figures herein will add to well over the total of cities in the survey group, due to counting the city once for each coin combination represented among all its meters.) Single coin meters appear at the curb in 438 cities, including 272 penny-only and 149 nickel-only. The latter cities are among a total of 289 that have some meters taking no pennies, but only other coins, singly or in various combinations. For off-street installations the decided favorite is the nickel-dime-quarter meter, found in 142 cities, followed by the nickel-quarter type in ninety-five and the penny-nickel-dime meter in seventy cities.

LAYOUT AND OPERATION, AT-CURB METERS

The prevalent pattern of parallel parking alongside the curb is carried over to metered spaces presumably in proportion to general usage and without regard to whether or not meters are utilized. Among the 990 cities with at-curb meters, 709 reported their standard length used for metered parking spaces, of which 651 fall within a range of eighteen feet to twenty-four feet.

The twenty-two feet length is most prevalent, being reported by 361 cities, over three times the 101 using the twenty feet length, next most popular. Splitting the difference are sixty-two cities with twenty-one feet per space; forty-three and thirty-five show twenty-three feet and twenty-four feet respectively, while eighteen feet is standard in thirty-eight reporting cities. Among cities in the eighteen feet to twenty-four feet range, nearly half of those below 2,500 provide twenty-one feet or less, while twenty-two feet or more is the standard allowance in eighty-five percent of cities of 250,000 to 500,000, in eighty percent of those of 50,000 to 100,000 and over seventy-five percent of those in the 25,000 to 50,000 group and those of over 1,000,000 population.

Stretch-out. At least 119 reporting cities have attempted to accommodate the longer new cars more comfortably by recently lengthening the per-car space allowed at curbside meters, although dates are pre-1956 in ten cases. These adjustments appear to have been most frequent in the North Central, Far West and North Atlantic regions. Space added was predominantly two feet, in sixty-four of the 110 cities giving "before" and "after" figures; the

newly attained length was twenty-two feet in 68 of 117 reporting this data.

Lengthening by only a single foot was reported by eight cities while five-foot extensions were noted by three others. The most dramatic space expansion is reported from Texas, where Denton in 1958 entered the space age with a six foot increase in the standard, from the prevalent twenty-two feet to a de luxe twenty-eight feet per car. Costs of their efforts to accommodate the elongated new cars, in terms of metered spaces lost by lengthening spaces without being able to lengthen the city blocks containing them, were reported by seventy of the 119 cities. None of four adding only a single foot lost as much as five percent in car spaces. At the other extreme, three cities claim losses of over twenty percent—one of twenty-three percent for a two foot increase, thirty percent and forty percent for unspecified increases. Five foot increases cost the three cities five percent, fourteen percent and fifteen percent in car spaces. Cities reported other percentage losses in car spaces, related to footage added to the standard space, as follows:

Cities lengthening spaces by:	*Percentage Loss in Metered Spaces*					
	1–4%	*5%*	*6–9%*	*10%*	*11–19%*	*20%*
2 feet	9	7	8	11	–	1
3 feet	6	–	1	2	3	–
4 feet	1	2	1	1	1	2

On the Bias. Some diagonal parking at meters is provided by well over half the 990 cities with curbside installations. Those indicating the number of diagonals reported some 94,000 of their over 280,000 at-curb meter spaces were so arranged. If the same proportion applies for over 100 cities reporting diagonals but without indicating how many, some 115,000 of the 385,000 meters reported upon provide "on the bias" parking spaces. Somewhat surprising is the extent to which the diagonal layout dominates the whole of metered at-curb parking in many cities. A total of 171 cities report that half or more of their at-curb meters govern diagonal spaces; in 43 of these cities *all*, and in twelve others virtually all, at-curb metered spaces are diagonal.

Of the 171 cities with fifty percent to 100 percent diagonal meters, 135 are divided equally—forty-five each—among the three

population groups spanning populations of 2,500 to 25,000; however there are only fourteen such cities in the smallest group with under 2,500 population. Only three such are above 100,000—Columbia, S.C., Lincoln, Nebr., and Salt Lake City, Utah, each reporting as diagonal a little over half their total of at-curb meters. Among cities reporting exactly or virtually 100 percent diagonals for their at-curb meters, the four largest are between 25,000 and 50,000 population and in the Southwest region, which has fifteen such cities between 5,000 and 25,000, as many of the size as are reported from all the rest of the country.

Of 367 cities reporting curb width required per space, eight feet and twelve feet are reported by sixty-eight cities each, and nine feet and ten feet by sixty-one each. The allowance is eleven feet in forty-seven cities, twenty report only six to seven feet, and forty-two between thirteen and eighteen feet. Among the angles of diagonal employed, forty-five degrees is predominant, in 192 of 308 reporting cities; fifty-two report the sixty degree and thirty-nine use the thirty degree angle. Angles of ten degrees or twenty degrees are reported by ten, and of ninety degrees by fifteen cities. The most prevalent combination of angle and curb width is forty-five degrees and twelve feet in fifty of 294 fully reporting cities. The forty-five degree angle combines with eight feet in thirty-four, with eleven feet in thirty, with ten feet in twenty-seven and with nine feet in eighteen cities. The combination is sixty degrees and nine feet in fifteen cities and sixty degrees and ten feet in twelve; none others count over ten reporting cities.

Short-limit Spaces. At-curb meters with shorter time limits than others in the vicinity are often provided by cities in front of the post office, banks, the city hall and other locations where motorists may have business of some urgency which can customarily be transacted in a relatively short time. Overall, the post office is selected for short-time meters by a third of all cities in the survey group, banks by a quarter of them, and city hall by twelve percent of 990 cities. The proportions are in each case almost exactly doubled when only the sixty-seven cities over 100,000 population are considered.

Since all these reports relate to metered spaces, a low level for cities of under 10,000—less than a fourth for post office, under five percent for city hall—may be due in some cases to a policy of pro-

viding short-limit *free* spaces at such locations. Almost one-fourth of the cities between 10,000 and 100,000 population provide some short-limit meters at end-of-block locations, as do nearly one-fifth of the larger cities—but only six percent of those of 10,000 or less. In addition to the four specified locations, 105 cities gave 114 additional sites of short-limit meters in their communities. Business and commercial establishments were named in forty-four cases, led off by drug stores in ten cities, laundries in five and cleaners, groceries and liquor stores in four each. Business offices of public utilities were also reported by forty-four cities, generally in fourteen, and specifically for the telephone company in eighteen cases. Six cities named the gas company, four electric and two water. Short-limit meters were reported at other public buildings by thirteen cities, including libraries in seven cases, and thirteen report such meters in relation to street characteristics, including mid-block locations in five cases.

Color codes. A few cities paint meter heads and/or posts in distinctive colors to enable motorists to identify the governing time limits at a glance. While the survey included no inquiry on this point, isolated cases show no uniformity in color-codes employed. A trace of traffic-light symbolism appears in using red for shortest-limit meters (West Hartford, Conn., Newark, Ohio), orange (Olean, N.Y.) or yellow (Evansville, Wis.); green appears for the longest-limit at-curb meters in the three using more than one color. Colors used for meters with intermediate limits include blue, gray and silver.

Other Gimmicks. Other at-curb layouts explored in the survey included (a) arrangement of spaces in pairs so that two adjacent cars are parked bumper-to-bumper with maneuvering space concentrated between the paired vehicles, (b) a leapfrog arrangement whereby metered spaces and free spaces are alternated, usually along the fringe of metered areas, and (c) provision of a few "undersized" spaces for small compact cars. On the latter a sense of disappointment may be felt at an apparent lack of ingenuity in utilizing scraps of curbside space which must often, or might, result from necessarily lengthening the conventional spaces. Among the 990 with at-curb meters only one—Seattle—reports that it is providing some such spaces.

In contrast, seventy-four cities report using the paired arrangement for at least some of their at-curb meters. Los Angeles reports

that all of its nearly 12,000 meters are so arranged; Philadelphia reports thirty pairs among its 14,400 meters. Others above 250,000 reporting paired layouts include Kansas City, Mo., Portland, Ore., St. Paul, San Antonio and Seattle—and also Los Angeles County. Half the total of cities reporting paired meters are between 10,000 and 50,000 population; none are below 5,000. California alone supplies over twenty-eight percent of the national total using pairs of at-curb meters.

The leapfrog arrangement of free and metered spaces is reported by only eleven cities, of which Columbia, S.C. is the largest. Of the other ten, four are between 50,000 and 100,000, and four between 5,000 and 10,000 population.

Operational Schedules. Generally the at-curb parking meter is an instrument that devours coins only during daylight hours on weekdays including Saturdays, but rests on Sundays and a limited number of holidays. A few variations from this universal pattern do appear, however. For example, ten cities in the survey group report that their meters *do not* operate on Saturdays—among them are Boston, Minneapolis and Toledo. These three have a "five-day week" for a toal of 13,586 at-curb meters.

There is no day of rest for meters that operate on Sundays in fourteen reporting cities—for reasons apparent from the name and fame of such places as Asbury Park, N.J., Laguna Beach, Calif., Lake George, N.Y., St. Petersburg Beach, Fla., and Wisconsin Dells, Wis. Meters that operate on holidays are reportedly to be found along the streets of Los Angeles, San Francisco and Louisville, in the five resort cities just named, and in perhaps a dozen other municipalities. New York City, not within the survey group, reports that some of its at-curb meters also operate on Sundays and on holidays.

Holidays that are observed at meters in the vast majority of cities range in number from a single holiday to over twenty, each of these extremes reported by three cities. Among the total of 684 reporting, 160 merely indicate that meters are inoperative on all holidays; the largest group specifying are 154 cities with six holidays, followed by ninety with seven, sixty-two with eight, fifty-eight with five, thirty-five with ten, thirty-four with twelve and thirty-two with eleven.

Seasonal operation. Despite lack of specific inquiry several resort

cities reported that their meters go off-duty when their "off-season" rolls around. Among the "seasonal" meters are those of Lake Placid, N.Y., Charlevoix, Mich. and Savannah Beach, Ga. Off-season variations take the form of less frequent patroling in Keansburg, N.J., and shortened hours of operation in Wisconsin Dells, Wisconsin.

Operational Hours. The weekday work of the at-curb parking meter usually begins at 8:00 or 9:00 a.m. and ends at 6:00 p.m. Reporting cities are divided about equally between the two starting times. In Maryland the meters in Rising Sun belie the city's name and don't start working till 10:00 a.m.—along with those in fourteen other cities. Meters get on the job at 7:00 a.m. in a number of sizeable cities, however, including Cincinnati, Cleveland, Honolulu, Houston, Louisville and San Francisco—and even at 6:00 a.m. in Wichita.

All "call it a day" at 6 p.m., along with all but about 150 of the 990 cities. Five o'clock ends the meter's day in Lubbock, Grand Rapids, and 120 other cities, of which nearly half are in five states—Illinois, Iowa, Kansas, Minnesota, and Texas—having ten to twelve such cities each. Meters become inoperative at 4 p.m. in Hilo (Hawaii Co.), Hawaii and in three small mainland cities; of the whole 126 pre-six o'clock cities, eighty percent are between 2,500 and 10,000 population. At-curb meters continue operating beyond 6 p.m. in St. Louis, Washington, and twenty-eight other cities, ceasing at 10 p.m. at State College, Pa., Porter, Ind., and (in midtown) New York City. Excluding those mentioned, half the cities with late-running meters are between 10,000 and 25,000 population.

Fridays till Nine. In a good many cities at-curb meters are operative for longer hours on one or more specific nights a week. Extended operation depends largely upon local "shopping nights" practices. Where it occurs, "Fridays till nine" is the predominant pattern, being prevalent throughout New England and in such states as Michigan, Minnesota, New Jersey, New York, Ohio, Pennsylvania and Wisconsin.

Friday and Saturday evenings, usually till nine, are about equally favored in Illinois and Missouri, but the latter has the edge in Indiana, Iowa, Kansas, Nebraska and West Virginia. Practically

no overtime use of meters on shopping nights appears to exist in the entire Southeast, Southwest and Far West regions, nor in the District of Columbia and adjoining states. Only three cities of over 500,000 report extended operation on shopping nights—Chicago on Mondays and Thursdays, Detroit on Saturdays and Milwaukee on Fridays.

FADING FADS

The AMA–HRB study reported that in 1951 "a movement seems to be gaining impetus" to place private advertising matter on parking meters, citing at least forty-nine localities in twenty-three states having such advertising in effect or contracted for, noting that eighteen other localities in ten states were then considering proposals or contracting for installation of the advertising devices. The most numerous groups of cities permitting advertising were in Illinois, Pennsylvania and Tennessee.

Currently only five cities among the whole group, none in the states mentioned, report carrying advertising atop their meters and far fewer than forty-nine indicate that they ever did. The relatively sudden demise of this innovation stemmed from adverse court decisions and legal opinions, unfavorable public reaction and failure to achieve anticipated revenues, in about that order.

"*Token*" *Payments for Parking.* Another innovation of recent vintage, not covered in the earlier study, appears also to have failed of adoptions to any considerable extent. The design of meters to accommodate a special token in addition to regular coins, with these tokens obtainable free from merchants by patrons of their establishments, appears to have had relatively few takers. Within the whole group, less than twenty cities indicate that they have meters accepting "tokens," which the city sells to participating merchants at going rates. All such meters are limited to off-street locations except in three cities where at-curb meters will take the tokens.

In two of these three the system is not in use currently; the other is Newport, R.I., far ahead of all the others in the number of such meters in use, reporting all 800 at-curb and off-street meters. One Illinois city also reports a token system, involving only sixty-five off-street meters, in which ten-cent and twenty-five-cent tokens are used free by employees whose employer(s) purchases them from

the city. These provide parking for four hours and twelve hours, respectively, in contrast to the one hour period which is provided by all but two of the shopper token systems. Shopper token systems are reported by four California cities, two each in Pennsylvania and Illinois, and only a single city in other particular states.

DISTAFF ENFORCEMENT

When New York City recently put a force of 100 specially recruited and trained meter maids in the field to police parking meters, it was a late comer to the ranks of cities with such personnel but probably increased by about ten percent the total of women so employed. A recent partial inventory prepared in connection with the AMA survey, but drawing upon other sources of information as well, indicates that well over 883 meter maids are now employed by 356 cities in forty-six states. The four states not included are Hawaii, Maine, North Dakota, and Vermont; nor have we reports as to any employed in the District of Columbia or Puerto Rico. Even with the New York City group included the State of New York, showing over 135 in sixteen cities, may have its lead challenged by California, with over 100 in thirty-eight cities, or by Texas, with more than ninety-one in thirty-three cities. Other sizeable contingents are to be found in Florida, with over forty-seven in eighteen cities, Pennsylvania with more than forty-four in twenty, and Illinois, thirty-eight plus in twenty-one cities. New Jersey and North Carolina each have at least thirty-three meter maids, in sixteen and twenty-two cities, respectively.

PROTECTION OF REVENUE

The frequency of collecting coins from meters was reported by 917 cities as to at-curb meters, of which 622 collect weekly and another thirty-six collect from most weekly but others more frequently. Daily collections are reported by twenty-six cities, twice-a-month by 145 and monthly by only seven cities.

Off-street collections are made weekly by 267 of 382 reporting cities, daily collections by only eleven, but semi-monthly serves sixty-eight and twenty-two use monthly schedules. In 340 cities reporting practices for both at-curb and off-street meters, 246 use identical collection schedules for both.

Protective Devices. Among 959 cities reporting one or more protective devices incorporated into some or all of their meters, eighty percent mention windows holding the last coin in view, thirty-four percent sealed coin receptacle boxes, twenty-eight percent special anti-vandal locks, sixteen percent snap locks and seven percent coin registers. The Southwest and Far West regions are well above national averages as to coin registers and anti-vandal locks, having approximately ten percent and thirty-two percent, respectively.

VANDALISM

Among 988 cities giving some reply as to vandalism of parking meters, 353 or over one-third consider it to be, specifically or inferentially, no problem. Of cities so responding, well over half are of 10,000 or less population. Meter vandalism is held to be a minor problem by 501 cities that specify coin theft in seventy-seven, and destruction in 424, of their replies. Almost half these cities are between 5,000 and 25,000 population.

While only forty-six cities term meter vandalism a major problem, half of them are above perhaps 75,000, even though every population group is included, down to the under-2,500 group, with four cities so replying. Destruction is cited over coin theft by a 3 to 2 ratio with six replies citing both. The major responses come from all geographic regions in a rough proportion to the cities therein.

Extent. In reporting the number of their parking meters vandalized in recent months, 279 elected to reply on the basis of exactly twelve months. Among these cities were representatives of an average of over eight out of ten population groups in each region. They cited 17,433 meters vandalized in a year, of which 7,000 were reported by Baltimore alone. Since many of the largest cities reported on a basis different (usually shorter) than twelve months, the following figures as of twelve months have been interpolated from their replies, whether within or outside the "thousand" cities:

The City of New York cites no figures, but Chicago's report is at the rate of 810 per year, Detroit's at 142, Philadelphia reports 2,200 and Pittsburgh figures equal 200 a year.

In Ohio, Cleveland reports 943, Cincinnati at a 400 and Columbus at a 590 rate.

In Southern California, Los Angeles reports at an annual rate

of 1,446, Los Angeles County 80, Long Beach at 3,200 and San Diego 200 annually.

In New England, Boston reports at the rate of 400 and Hartford shows 362, though Providence cites but ten cases and Worcester none.

Other reports and calculations show 694 for New Orleans, 600 for San Francisco, 500 at St. Louis and 300 in Houston.

Means of Combating. More rugged construction of meters including "anti-vandal" locks is called for in replies from New York, Chicago, Philadelphia and two other cities named above. Such construction, plus special police activity, is mentioned by two more of the above, while intensified regular or special police activity is offered by eight of the cities. Four of the cities offer no suggestions. Overall, within the survey group, the 988 cities suggest police effort in 172 cases, plus 145 naming various types of patrol actions. Less than a dozen stress construction of better protective equipment and 140 offer no suggestion.

PUBLIC ATTITUDES

Responding city officials were asked for their appraisals of the opinion of various segments of the public on at-curb meters before and after their installation. The dual appraisals required were given by 642 as to the general citizenry, by 533 as to their rural or suburban neighbors, by 640 as to businessmen generally, by 548 as to businesses particularly affected, and by 141 as to "other" groups of their own choosing. Ratings were given on a five-point scale from "highly adverse" to "highly favorable." Changes of opinion are grouped as favorable when moving upward, adverse when moving downward; lack of change is "status quo" being adverse, neutral or favorable dependent upon its position on the scale. Accordingly the shift or lack of shift of opinion as to meters may be summarized by number of cities as follows:

	Change		*Status Quo*		
	Adverse	*Favorable*	*Adverse*	*Neutral*	*Favorable*
Local Citizens	24	435	12	47	124
Outside Neighbors	15	316	51	77	74
Business, general	35	416	9	31	149
Business, affected	16	340	11	54	127
"Others" Collectively	4	72	4	14	47

The existing status reported, disregarding change and allowing inclusion of single as well as dual replies, shows cities distributed thus as to public acceptance of parking meters:

	Highly Adverse	*Somewhat Adverse*	*Mixed or Neutral*	*Generally Favorable*	*Highly Favorable*
Local Citizens	7	20	129	465	98
Outside Neighbors	22	92	180	236	60
Business, general	10	23	96	363	218
Business, affected	9	17	100	348	120
"Others" Collectively	3	12	25	84	44

The other groups most frequently mentioned by respondents were the police in twenty-four cases, newspapers in sixteen, labor in eight and the Chamber of Commerce by six cities specifically. In each group except labor one downward trend only was noted, all others were even or upward. The labor group was the only one containing any opinion labeled as neutral, in two of the eight cases. Police were rated as generally or highly favorable in twenty-two of the twenty-four cities, newspapers in fourteen of sixteen, labor in five of eight, and the Chamber of Commerce in four of the six cities.

Results. The same five-point scale was used by respondents to rate the opinion of city officials as to whether meters (a) reduce overtime parking and (b) make parking easier to find—and also to indicate what viewpoints they believe the public holds. In relation to reduction in overtime parking the largest group of responses—258 of 526—held a highly favorable city official viewpoint. Respondents thought the public might be a bit less enthusiastic, with 306 of 521 giving but a generally favorable response. The same pattern was repeated as to whether meters make parking easier to find; the largest bloc of official viewpoint—290 of 528—held a highly favorable view but felt the public might make only a *generally* favorable appraisal, so rating 256 of their 520 responses.

TABLE I

DETAILED RATE SCHEDULES FOR AT-CURB PARKING METERS — BRACKETED BY WORTH OF A NICKEL

				10 minutes				*12 minutes*		*15 minutes*							
		Not Reported		*10 min./5c*		*20 min./10c*		*12 min./5c*		*3 min./1c*		*15 min./5c*		*30 min./10c*		*1 hr./20c*	
Regions	*States*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*
New England	6											2	9				
North Atlantic	6*			1	60	1	278	2	25			6	119	2	126		
North Central	7							1	44			14	1,223	2	382	1	301
Southeast	7																
Southwest	8							1	8			3	208	1	192		
Central West	8											7	842				
Far West	8	1	37							1	5	5	1,925	3	1,910		
TOTAL	50	1	37	1	60	1	278	4	77	1	5	37	4,326	8	2,610	1	301
Population																	
Over 500,000				1	60	1	278	1	14			8	3,400	3	2,097		
100,000—500,000												9	592	2	347	1	301
50,000—100,000		1	37									1	3				
25,000—50,000								3	63			2	91				
10,000—25,000										1	5	8	84	1	5		
5,000—10,000												5	55				
Under 5,000												4	101	2	161		

		20 minutes						*24 minutes*								*25 minutes*	
		4 min./1c		*20 min./5c*		*40 min./10c*		*24 min./5c*		*48 min./10c*		*2 hrs./25c*		*10 hrs./1.25*		*5 min./1c*	
Regions	*States*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*
New England	6							1	14								
North Atlantic	6*			2	52					1	14	1	14				
North Central	7													1	76	1	12
Southeast	7																
Southwest	8							1	20			1	100				
Central West	8			1	1,213											1	6
Far West	8	1	975	1	975	1	975	3	163	1	150	1	150			1	58
TOTAL	50	1	975	4	2,240	1	975	5	197	2	164	3	264	1	76	3	76
Population																	
Over 500,000		1	975	2	2,188	1	975	2	164	2	164	2	164				
100,000—500,000												1	100				
50,000—100,000				1	43			1	5								
25,000—50,000				1	9			1	20							2	70
10,000—25,000								1	8					1	76		
5,000—10,000																1	6
Under 5,000																	

10,000—25,000
5,000—10,000
Under 5,000

* Plus District of Columbia.

DETAILED RATE SCHEDULES FOR AT-CURB PARKING METERS — BRACKETED BY WORTH OF A NICKEL

		30 minutes										*36 minutes*			
		6 min./1c		*12 min./2c*		*30 min./5c*		*1 hr./10c*		*2 hrs./20c*		*36 min./5c*		*3 hrs./25c*	
Regions	*States*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*
New England	6	1	197			4	854	3	737						
North Atlantic	6*	7	851			31	11,192	22	19,501	3	963			2	1,690
North Central	7	14	3,584	1	75	40	16,358	26	12,645	4	1,661			3	562
Southeast	7	4	4,810			13	7,912	11	7,086	1	344			1	400
Southwest	8	5	77			22	8,852	14	7,530	3	1,320			1	14
Central West	8	8	2,700	1	19	16	6,766	10	4,458	1	41				
Far West	8	9	13,878	1	243	19	28,345	14	26,604	2	6,613	1	356		
TOTAL	50	48	26,097	3	337	145	80,279	100	78,561	14	10,942	1	356	7	2,666
Population															
Over 500,000		3	14,737			14	35,776	11	40,081	4	5,086			1	400
100,000—500,000		6	3,538	2	94	31	20,952	24	19,305	4	3,554	1	356		
50,000—100,000		8	2,902			22	7,834	12	6,228	3	1,590				
25,000—50,000		14	2,622			37	7,623	22	5,489	1	495			1	40
10,000—25,000		13	2,006	1	243	25	5,309	16	4,699					1	1,650
5,000—10,000		2	160			11	2,274	10	2,095	2	217			3	426
Under 5,000		2	132			5	511	5	664					1	150

		45 minutes						*48 minutes*		*50 minutes*							
		9 min./1c		*36 min./4c*		*45 min./5c*		*4 hrs./25c*		*10 min./1c*		*30 min./3c*		*1 hr./6c*		*2 hrs./12c*	
Regions	*States*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*
New England	6									1	200						
North Atlantic	6*									5	871	1	18				
North Central	7	1	56			1	56	1	4	1	27			1	725	1	195
Southeast	7			1	7					3	315						
Southwest	8																
Central West	8									6	1,245						
Far West	8									1	340	1	13				
TOTAL	50	1	56	1	7	1	56	1	4	17	2,998	2	31	1	725	1	195
Population																	
Over 500,000																	
100,000—500,000																	
50,000—100,000				1	7							1	18				
25,000—50,000		1	56			1	56			1	27			1	725	1	195
10,000—25,000										3	1,128						
5,000—10,000								1	4	4	868						
Under 5,000										9	975	1	13				

* Plus District of Columbia.

TABLE I—*continued*

DETAILED RATE SCHEDULES FOR AT-CURB PARKING METERS — BRACKETED BY WORTH OF A NICKEL

1 hour

Regions	*States*	*12 min./1c*		*24 min./2c*		*36 min./3c*		*1 hr./5c*		*2 hrs./10c*		*3 hrs./15c*		*4 hrs./20c*		*5 hrs./25c*	
		cities	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*
New England	6	46	16,963					48	26,826	23	11,432						
North Atlantic	6*	142	32,008					166	49,181	106	20,834	5	336	1	182	5	1,486
North Central	7	227	104,346	1	18			244	128,255	170	41,094	4	1,217	1	75	14	2,097
Southeast	7	102	38,841	2	22			110	45,848	76	23,949					4	670
Southwest	8	114	45,751	2	26			124	58,020	87	32,338	1	531	1	41	4	721
Central West	8	117	39,298	3	161	1	20	124	43,006	87	22,130	2	133	1	100	3	90
Far West	8	123	80,208	3	907	1	4	129	89,737	92	44,599			1	2,584	6	585
TOTAL	50	871	357,415	11	1,134	2	24	945	440,873	641	196,376	12	2,217	5	2,982	36	5,649
Population																	
Over 500,000		5	45,495					13	70,888	9	14,800			1	2,584	1	174
100,000—500,000		34	42,418					47	69,774	36	30,600	1	1,126			4	1,032
50,000—100,000		60	44,088	3	1,026			67	54,565	49	25,104	6	770			5	558
25,000—50,000		108	59,307	2	28	1	20	121	68,382	76	25,417	1	48	2	175	7	515
10,000—25,000		193	68,757	3	51	1	4	207	76,770	134	39,262			1	41	9	1,886
5,000—10,000		207	55,672	3	29			214	57,332	131	30,628	2	170	1	182	6	1,015
Under 5,000		264	41,678					276	43,162	206	30,565	2	103			4	469

1 hour | *1-1/5 hours* | *1-1/4 hours* | *1-1/3 hours*

Regions	*States*	*6 hrs./30c*		*8 hrs./40c*		*10 hrs./50c*		*12 hrs./60c*		*6 hrs./25c*		*15 min./1c*		*80 min./5c*		*4 hrs./15c*	
		cities	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*
New England	6											4	116	1	334	1	334
North Atlantic	6*									1	750	5	1,027				
North Central	7					4	201	1	45			12	1,185				
Southeast	7					3	357					3	114				
Southwest	8			1	22							10	582				
Central West	8											2	17				
Far West	8	1	63									4	64				
TOTAL	50	1	63	1	22	7	558	1	45	1	750	40	3,105	1	334	1	334
Population																	
Over 500,000		1	63									3	87				
100,000—500,000												2	53	1	334	1	334
50,000—100,000												4	132				
25,000—50,000						2	144			1	750	11	1,247				
10,000—25,000				1	22	1	19	1	45			12	1,478				
5,000—10,000						3	135					5	40				
Under 5,000						1	260					3	68				

* Plus District of Columbia.

5,000—10,000																			
Under 5,000							1	260							3	66			

* Plus District of Columbia.

DETAILED RATE SCHEDULES FOR AT-CURB PARKING METERS — BRACKETED BY WORTH OF A NICKEL

		1-1/2 hours						*2 hours*									
		18 min./1¢		*90 min./5¢*		*3 hrs./10¢*		*24 min./1¢*		*2 hrs./5¢*		*4 hrs./10¢*		*6 hrs./15¢*		*10 hrs./25¢*	
Regions	*States*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*
New England	6					1	334	9	1,039	9	1,071	2	495				
North Atlantic	6*	1	71	2	145	1	74	11	1,218	25	16,444	16	14,660			6	300
North Central	7							25	4,350	42	6,859	21	2,622			14	778
Southeast	7	1	97	2	190	3	220	12	1,915	23	3,522	12	921			4	243
Southwest	8							17	3,469	20	4,550	4	359			3	244
Central West	8			1	42	1	42	19	4,362	20	4,977	7	996			2	160
Far West	8							18	4,666	19	5,026	6	947	1	99	2	155
TOTAL	50	2	168	5	377	6	670	111	21,019	158	42,449	68	21,000	1	99	31	1,880
Population																	
Over 500,000								1	883	5	15,414	3	13,868			2	232
100,000—500,000				1	93	2	427	5	2,370	13	4,048	1	120			1	120
50,000—100,000				1	42	1	42	11	4,089	15	4,605	4	887			1	13
25,000—50,000		1	97	2	171	3	201	25	3,522	34	5,377	14	1,624			8	709
10,000—25,000		1	71	1	71			27	4,908	34	6,039	17	2,506	1	99	5	162
5,000—10,000								28	4,297	40	5,766	22	1,750			11	556
Under 5,000								14	950	17	1,200	7	245			3	88

		2-2/5 hours		*2-1/2 hours*				*3 hours*								*6 hours*	
		12 hrs./25¢		*5 hrs./10¢*		*10 hrs./20¢*		*36 min./1¢*		*3 hrs./5¢*		*6 hrs./10¢*		*9 hrs./15¢*		*24 hrs./20¢*	
Regions	*States*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*
New England	6																
North Atlantic	6*	3	112	1	18	1	18			1	18						
North Central	7	2	232	2	232			1	15								
Southeast	7																
Southwest	8															1	62
Central West	8			1	60					1	60						
Far West	8							1	23	3	96	1	47	1	47		
TOTAL	50	5	344	4	310	1	18	2	38	5	174	1	47	1	47	1	62
Population																	
Over 500,000																	
100,000—500,000		1	85	1	85												
50,000—100,000		1	40							1	26						
25,000—50,000		3	219	2	207			2	38	3	130	1	47	1	47	1	62
10,000—25,000				1	18	1	18			1	18						
5,000—10,000																	
Under 5,000																	

* Plus District of Columbia.

TABLE II

DETAILED RATE SCHEDULE FOR OFF-STREET PARKING METERS — BRACKETED BY WORTH OF A NICKEL

				12 minutes		*15 minutes*									
		Not Reported		*1 hr./25c*		*3 min./1c*		*15 min./5c*		*30 min./10c*		*1 hr./20c*		*75 min./25c*		*3 hrs./60c*	
Regions	*States*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*
New England	6																
North Atlantic	6*	3	663														
North Central	7	2	54	2	281			1	20	1	20			1	20	1	20
Southeast	7	1	16														
Southwest	8																
Central West	8					1	90	1	90	1	90	1	90				
Far West	8																
TOTAL	50	6	733	2	281	1	90	2	110	2	110	1	90	1	20	1	20
Population																	
Over 500,000		1	405	1	227	1	90	1	90	1	90	1	90				
100,000—500,000		1	16	1	54			1	20	1	20			1	20	1	20
50,000—100,000																	
25,000—50,000																	
10,000—25,000		1	238														
5,000—10,000		3	74														
Under 5,000																	

		18 minutes								*20 minutes*			
		18 min./5c		*36 min./10c*		*90 min./25c*		*3 hrs./50c*		*20 min./5c*		*40 min./10c*	
Regions	*States*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*
New England	6												
North Atlantic	6*												
North Central	7	1	32	1	32	1	32	1	32	1	2,231	1	2,321
Southeast	7												
Southwest	8												
Central West	8												
Far West	8												
TOTAL	50	1	32	1	32	1	32	1	32	1	2,321	1	2,321
Population													
Over 500,000		1	32	1	32	1	32	1	32	1	2,321	1	2,321
100,000—500,000													
50,000—100,000													
25,000—50,000													
10,000—25,000													
5,000—10,000													
Under 5,000													

* Plus District of Columbia.

Regions	States	24 minutes: 24 min./5c cities	24 min./5c meters	2 hrs./25c cities	2 hrs./25c meters	4 hrs./50c cities	4 hrs./50c meters	30 minutes: 6 min./1c cities	6 min./1c meters	30 min./5c cities	30 min./5c meters	1 hr./10c cities	1 hr./10c meters	90 min./15c cities	90 min./15c meters	2 hrs./20c cities	2 hrs./20c meters
New England	6									1	96	2	150				
North Atlantic	6*			1	50			1	4	8	838	9	2,839				
North Central	7			2	2,373	1	227	1	38	7	1,092	8	845	1	101	1	38
Southeast	7					1	96	1	53	7	692	6	676				
Southwest	8	1	96	1	96					2	156	2	156			2	156
Central	8							1	92	4	484	4	520				
Far West	8									5	2,332	6	2,610				
TOTAL	50	1	96	4	2,519	2	323	4	187	34	5,690	37	7,796	1	101	3	194
Population																	
Over 500,000				1	2,321	1	227	1	53	4	850	5	603			1	150
100,000—500,000		1	96	1	96	1	96			5	1,951	4	2,151	1	101	1	6
50,000—100,000				1	52			1	4	8	939	8	1,420				
25,000—50,000				1	50			2	130	12	1,466	14	3,084			1	38
10,000—25,000										4	342	5	396				
5,000—10,000										1	142	1	142				
Under 5,000																	

Regions	States	30 minutes: 3 hrs./30c cities	3 hrs./30c meters	5 hrs./50c cities	5 hrs./50c meters	36 minutes: 3 hrs./25c cities	3 hrs./25c meters	6 hrs./50c cities	6 hrs./50c meters	9 hrs./75c cities	9 hrs./75c meters	45 minutes: 45 min./5c cities	45 min./5c meters	3 hrs./20c cities	3 hrs./20c meters
New England	6					3	743	1	111	1	111	1	300	1	300
North Atlantic	6*	1	501	1	111	6	528								
North Central	7					3	292	1	76						
Southeast	7			1	86	5	623								
Southwest	8														
Central West	8			1	87	4	670								
Far West	8					3	2,073								
TOTAL	50	1	501	3	284	24	4,929	2	187	1	111	1	300	1	300
Population															
Over 500,000						2	337								
100,000—500,000						3	2,417								
50,000—100,000		1	501	1	87	9	1,217					1	300	1	300
25,000—50,000				1	86	6	530	1	76						
10,000—25,000				1	111	3	317								
5,000—10,000						1	111	1	111	1	111				
Under 5,000															

* Plus District of Columbia.

TABLE II—*continued*

DETAILED RATE SCHEDULE FOR OFF-STREET PARKING METERS — BRACKETED BY WORTH OF A NICKEL

		48 minutes						*50 minutes*		*1 hour*							
		48 min./5¢		*96 min./10¢*		*4 hrs./25¢*		*10 min./1¢*		*12 min./1¢*		*1 hr./5¢*		*2 hrs./10¢*		*3 hrs./15¢*	
Regions	*States*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*
New England	6									4	214	15	4,447	8	3,217	2	748
North Atlantic	6*					2	190			15	796	50	8,087	42	5,958	2	249
North Central	7	1	504	1	504	2	519	1	60	36	6,215	81	17,118	73	15,389	4	691
Southeast	7									6	345	21	3,057	19	3,038	1	202
Southwest	8									4	84	16	1,139	10	768		
Central West	8							1	30	11	687	22	2,635	18	2,571	1	35
Far West	8	1	209	1	209	3	373			22	3,141	35	6,469	33	5,161	1	139
TOTAL	50	2	713	2	713	7	1,082	2	90	98	11,482	240	42,952	203	36,102	11	2,064
Population																	
Over 500,000										2	514	6	1,534	5	768		
100,000—500,000		1	209	1	209	1	209			5	368	16	4,757	13	4,050	2	803
50,000—100,000		1	504	1	504	3	668			10	3,113	39	13,392	39	11,980	5	632
25,000—50,000										26	3,658	61	11,543	50	9,528	1	202
10,000—25,000								2	90	28	2,714	68	8,646	57	7,231	3	427
5,000—10,000						2	73			14	778	33	2,381	27	2,037		
Under 5,000						1	132			13	337	17	699	12	508		

		1 hour										*1-1/7 hours*	
		4 hrs./20¢		*5 hrs./25¢*		*6 hrs./30¢*		*9 hrs./45¢*		*10 hrs./50¢*		*12 hrs./60¢*		*16 hrs./70¢*	
Regions	*States*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*
New England	6			1	192					1	192				
North Atlantic	6*	1	233	22	2,787					9	1,466	2	433		
North Central	7	5	632	32	6,724	1	265			13	3,231	4	365		
Southeast	7	1	102	14	1,901					4	692	1	250		
Southwest	8			9	645					2	248				
Central West	8	2	495	8	1,551			1	28	1	363			1	113
Far West	8	2	364	10	1,747					3	255				
TOTAL	50	11	1,826	96	15,547	1	265	1	28	33	6,447	7	1,048	1	113
Population															
Over 500,000				1	363					1	363	1	250	1	113
100,000—500,000		1	200	9	2,442					6	1,889	1	117		
50,000—100.000		2	364	17	4,170			1	28	2	615				
25,000—50,000		6	1,089	25	3,956	1	265			8	1,790	2	284		
10,000—25,000		1	148	24	2,943					10	1,037	3	397		
5,000—10,000		1	25	16	1,421					4	564				
Under 5,000				4	252					2	189				

10,000—25,000		1	25	16	1,421											4	504		
5,000—10,000				4	252											2	189		
Under 5,000																			

* Plus District of Columbia.

DETAILED RATE SCHEDULE FOR OFF-STREET PARKING METERS — BRACKETED BY WORTH OF A NICKEL

		1-1/5 hours				*1-1/4 hours*		*1-1/3 hours*		*1-2/5 hours*		*1-1/2 hours*					
		6 hrs./25c		*12 hrs./50c*		*15 min./1c*		*4 hrs./15c*		*84 min./5c*		*18 min./1c*		*90 min./5c*		*3 hrs./10c*	
Regions	*States*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*
New England	6													3	902	2	800
North Atlantic	6*	2	350	2	156									2	207	2	207
North Central	7	5	433					1	74	1	35			5	779	6	814
Southeast	7											1	135	2	300	1	135
Southwest	8					1	14									2	217
Central West	8											1	59	3	311	2	283
Far West	8													2	174	2	64
TOTAL	50	7	783	2	156	1	14	1	74	1	35	2	194	17	2,673	17	2,520
Population																	
Over 500,000																	
100,000—500,000														1	118		
50,000—100,000		1	250											5	1,342	5	1,342
25,000—50,000		4	450	1	24							2	194	6	615	6	639
10,000—25,000		1	14			1	14	1	74	1	35			4	558	4	491
5,000—10,000														1	40	2	48
Under 5,000		1	69	1	132												

		1-3/5 hours				*2 hours*											
		8 hrs./25c		*16 hrs./50c*		*24 min./1c*		*2 hrs./5c*		*4 hrs./10c*		*6 hrs./15c*		*8 hrs./20c*		*10 hrs./25c*	
Regions	*States*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*
New England	6					1	17	8	1,844	5	868	1	123	1	123	7	1,714
North Atlantic	6*	2	146			2	27	22	2,264	18	1,828					15	2,061
North Central	7	2	298	1	73	11	670	56	6,716	48	5,934					45	5,692
Southeast	7					1	50	14	2,078	13	1,892					12	1,883
Southwest	8	1	165			4	202	10	1,289	8	1,193					7	975
Central West	8	2	182			8	719	17	2,185	15	1,847					13	1,807
Far West	8					10	965	28	4,456	27	4,040			1	26	25	3,420
TOTAL	50	7	791	1	73	37	2,650	155	20,832	134	17,602	1	123	2	149	124	17,552
Population																	
Over 500,000						1	178	3	1,086	3	1,086					4	956
100,000—500,000								4	816	3	570					3	681
50,000—100,000		1	262			3	171	22	5,303	17	3,694	1	123	1	123	21	4,780
25,000—50,000		3	121	1	73	5	380	37	5,703	35	4,893					35	4,665
10,000—25,000		2	288			13	1,209	49	5,328	44	5,184			1	26	30	4,279
5,000—10,000		1	120			9	499	31	2,188	23	1,805					24	1,875
Under 5,000						6	213	9	408	9	370					7	316

* Plus District of Columbia.

TABLE II—*continued*

DETAILED RATE SCHEDULE FOR OFF-STREET PARKING METERS — BRACKETED BY WORTH OF A NICKEL

		2 hours				*2-2/7 hours*		*2-2/5 hours*				*2-1/2 hours*					
		12 hrs./30c		*20 hrs./50c*		*16 hrs./35c*		*12 hrs./25c*		*24 hrs./50c*		*30 min./1c*		*5 hrs./10c*		*10 hrs./20c*	
Regions	*States*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*
New England	6							2	284					3	1,162	1	905
North Atlantic	6*	1	82					14	2,347					1	472	1	472
North Central	7			1	54	1	69	10	1,083	1	35			3	462		
Southeast	7							1	89								
Southwest	8													1	133		
Central West	8			1	29			1	127			1	32	1	74	1	74
Far West	8													1	163		
TOTAL	50	1	82	2	83	1	69	28	3,930	1	35	1	32	10	2,466	3	1,451
Population																	
Over 500,000								1	187								
100,000—500,000																	
50,000—100,000								2	421					3	1,286	1	905
25,000—50,000						1	69	8	1,773					3	464	1	74
10,000—25,000		1	82	2	83			10	1,244	1	35			3	642	1	472
5,000—10,000								4	195			1	32	1	74		
Under 5,000								3	110								

		3 hours								*3-1/5 hours*		*4 hours*					
		3 hrs./5c		*6 hrs./10c*		*12 hrs./20c*		*15 hrs./25c*		*16 hrs./25c*		*4 hrs./5c*		*8 hrs./10c*		*24 hrs./30c*	
Regions	*States*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*
New England	6	1	905														
North Atlantic	6*	2	1,266	1	794	1	794					1	465				
North Central	7	1	321					1	308	1	297	1	189	1	189		
Southeast	7																
Southwest	8	2	177														
Central West	8																
Far West	8	1	224	1	224					1	148	1	21			1	44
TOTAL	50	7	2,893	2	1,018	1	794	1	308	2	445	3	675	1	189	1	44
Population																	
Over 500,000																	
100,000—500,000																	
50,000—100,000		2	1,129	1	224												
25,000—50,000		4	1,292	1	794	1	794	1	308	1	297	3	675	1	189	1	44
10,000—25,000		1	472							1	148						
5,000—10,000																	
Under 5,000																	

* Plus District of Columbia.

Under 5,000

* Plus District of Columbia.

TABLE II—*continued*

DETAILED RATE SCHEDULE FOR OFF-STREET PARKING METERS — BRACKETED BY WORTH OF A NICKEL

		4-4/5 hours		*5 hours*				*6 hours*						*10 hours*				*12 hours*	
		24 hrs./25c		*5 hrs./5c*		*10 hrs./10c*		*6 hrs./5c*		*12 hrs./10c*		*24 hrs./20c*		*2 hrs./1c*		*10 hrs./5c*		*20 hrs./10c*		*24 hrs./10c*	
Regions	*States*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*	*cities*	*meters*
New England	6	1	32																
North Atlantic	6*	2	83							1	194								
North Central	7	3	628	1	59	1	59							1	22	1	22	1	22
Southeast	7																		
Southwest	8																		
Central West	8	1	574					1	92	1	92								
Far West	8	2	62									1	107						
TOTAL	50	9	1,379	1	59	1	59	1	92	2	286	1	107	1	22	1	22	1	22	1	30
Population																			
Over 500,000		1	26																
100,000—500,000																			
50,000—100,000		3	436							1	194								
25,000—50,000		1	142					1	92	1	92	1	107						
10,000—25,000		4	775	1	59	1	59							1	22	1	22	1	22
5,000—10,000																			
Under 5,000																		1	30

* Plus District of Columbia.

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